The Electrical Industry's Weekly Magazine

February 11, 1957

Electrical World

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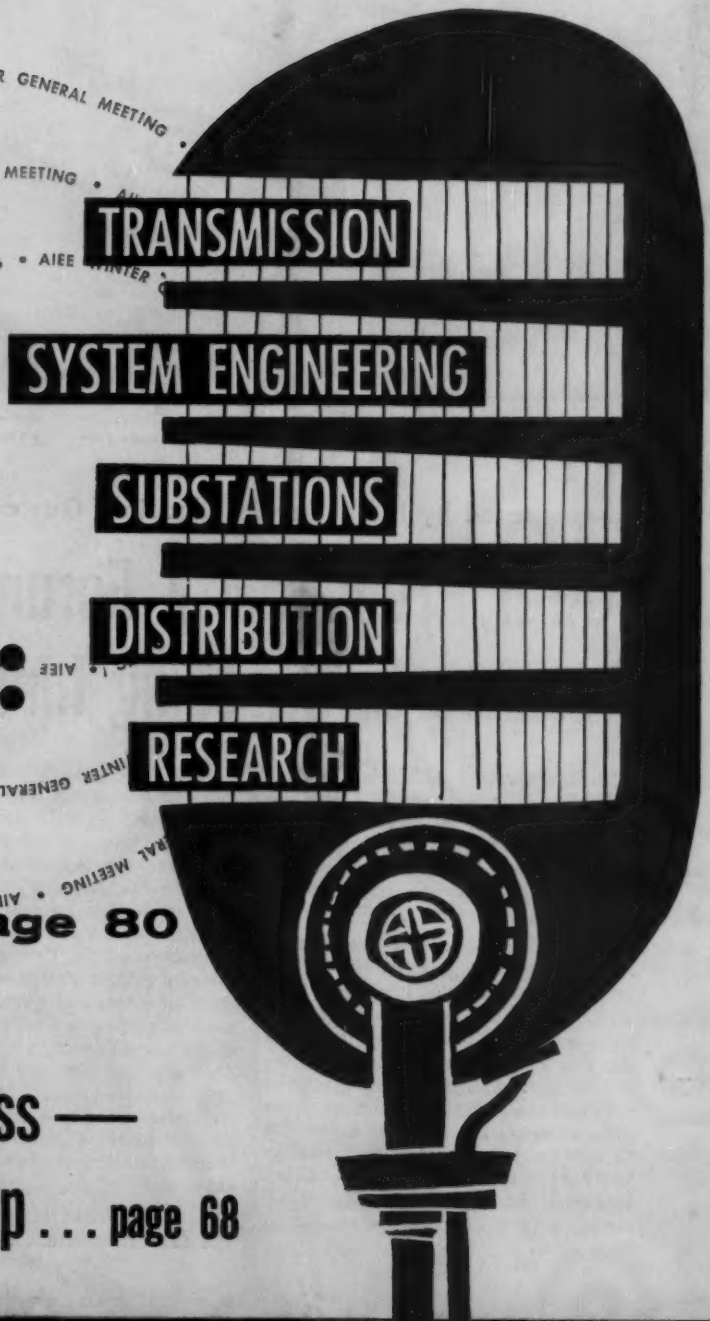
A McGraw-Hill Publication

AIEE Winter General Meeting Reports on:



... page 80

Power Bills in Congress — An Interpretive Roundup ... page 68

F. W. McChesney, a General Electric co-ordinator of Industrial Productivity Forums since their inception, presents well-known talk on future productivity requirements, underscoring role of industrial electrification. Dots on map indicate sites of 100 Forums held since programs began in 1949.

Co-sponsored by Public Service Electric & Gas and General Electric . . .

100th Productivity Forum Marks Seven-Year Advance in Speeding Industrial Electrification

The January 17 Industrial Productivity Forum in Newark, N. J. was the 100th of its kind. It marks more than seven years of progress in stimulating industrial electrification through programs brought to 84 cities by 67 individual electric utility companies.

Over twenty thousand industrial managers, realizing higher productivity is vital as competition increases, have attended the day-long meetings. Their comments on these More Power to America Forums have been highly encouraging, and most co-sponsoring utilities plan repeat showings. The success of the forums reflects industry's determination to achieve the predicted high productivity of the future and the utilities' leadership in taking these educational messages to industrial management in their areas.

MUTUAL BENEFITS

Industry has applied ideas gained from Forum talks on such subjects as materials handling and automation in planning plant expansions. Utilities have seen "grass roots" contact with industrial customers at the Forums help spur new industrial load. General Electric, through suggestions from Forum guests, has gained a greater awareness of industry's electrical needs and has continually improved the program so it is now a pool of the latest thinking for increasing productivity. All three—industry, electric utilities, and General Electric—have found the valuable interchange of ideas afforded by the Forums has greatly furthered mutual understanding of electric power and equipment problems.

FUTURE FORUMS

The first 100 Forums have covered a wide area, but there are still many key cities where industrial power users could benefit from such meetings. General Electric plans to co-sponsor with progressive utilities like Public Service Electric and Gas at least 100 more Forums in the next five years, with emphasis on areas where meetings have not been held. For more information on Industrial Productivity Forums, contact your General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

301-346

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 6 Feb. 11, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

New Power Bills Before Congress

An interpretive rundown of measures now facing legislators and what's likely to happen to them.....p 68

Looking Ahead to A-Hearings

Joint Committee on Atomic Energy to probe state of the industry against backdrop supplied by AEC report....p 70

EEI Task Force Girds for Action

Five men now are gathering data on atomic energy to help utilities with nuclear problems.....p 71

PUBLIC RELATIONS

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MEETING REPORT

AIEE Winter General Meeting

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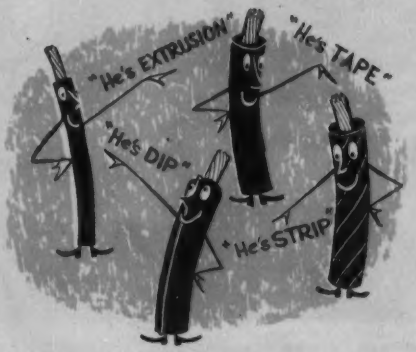
Listen, friends, to the hideous fate of the man who learned about cables too late

Lucius K. Watt was an engineer
He was eager and honest and able,
And one of the things he did for his firm
Was to buy electrical cable.

Now he knew all the people at Okonite
But with orders he'd seldom reward 'em,
"Because," he would state, "the cables are great
But who in the world can afford 'em?"

(Now that was a fault of the late Lucius K's—
That he had such a silly illusion;
For Okonite insulates cables *all* ways:
Strip, taping, dip and extrusion.



Only Okonite uses all methods, you see—
Our prices are *not* always highest;
And thus when you ask us what cable to use
Our recommendation's unbiased.)

So Lucius K. Watt went out and he bought
A cable he heard was a bargain
And this was too bad, for Lucius was had . . .
By some Madison Avenue jargon.

The thing was installed (with a minor defect)
In a most inaccessible place;
When Lucius K. Watt went out to inspect . . .
The cable blew up in his face!

We hate to relate this horrible fable
But here is the moral for all:
If you should desire a superior cable—
By extrusion or strip . . . by taping or dip
Just write us a letter, or call.

No matter *what* insulation or method of application you want (and we use them all) you'll get the best of its kind from Okonite. For a frank, down-to-earth discussion on cable insulating methods, write for Bulletin EW-1106, The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

4754

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. . . *from the publisher*

The reader who cannot read 550 words per minute is handicapped. This, at least, is what reading experts at Purdue University say. At that rate you should finish this column in the next 25 seconds. That's a little better than one line of type per second.

Time to read, as said here before, is one of the biggest problems facing the man in business. Whatever his job, he's paid to produce. To produce he has to be informed. To be informed he has to read. And when he reads, he wants to absorb as much as possible in as little time as possible.

Many firms are investing thousands of dollars in special courses to help their employees speed up their reading. Electrical World is trying to help in another way. Instead of speeding up your reading, we are trying to speed up the things you read.

Good example is our new Electrical Week (p 20), a two-minute summary of the week's Electrical World stories. Each item is marked with the field it covers (Generation, T&D, Selling, etc) plus the page on which you'll find the complete story. It not only gives you a fast-paced roundup of what is significant, it helps "spot" the articles of most interest to you as you move through the rest of the editorial and advertising pages.

Turn to page 20. Within two minutes you'll have a complete summary of what is new in the Electrical World.

Fischer Black

ELECTRICAL WORLD

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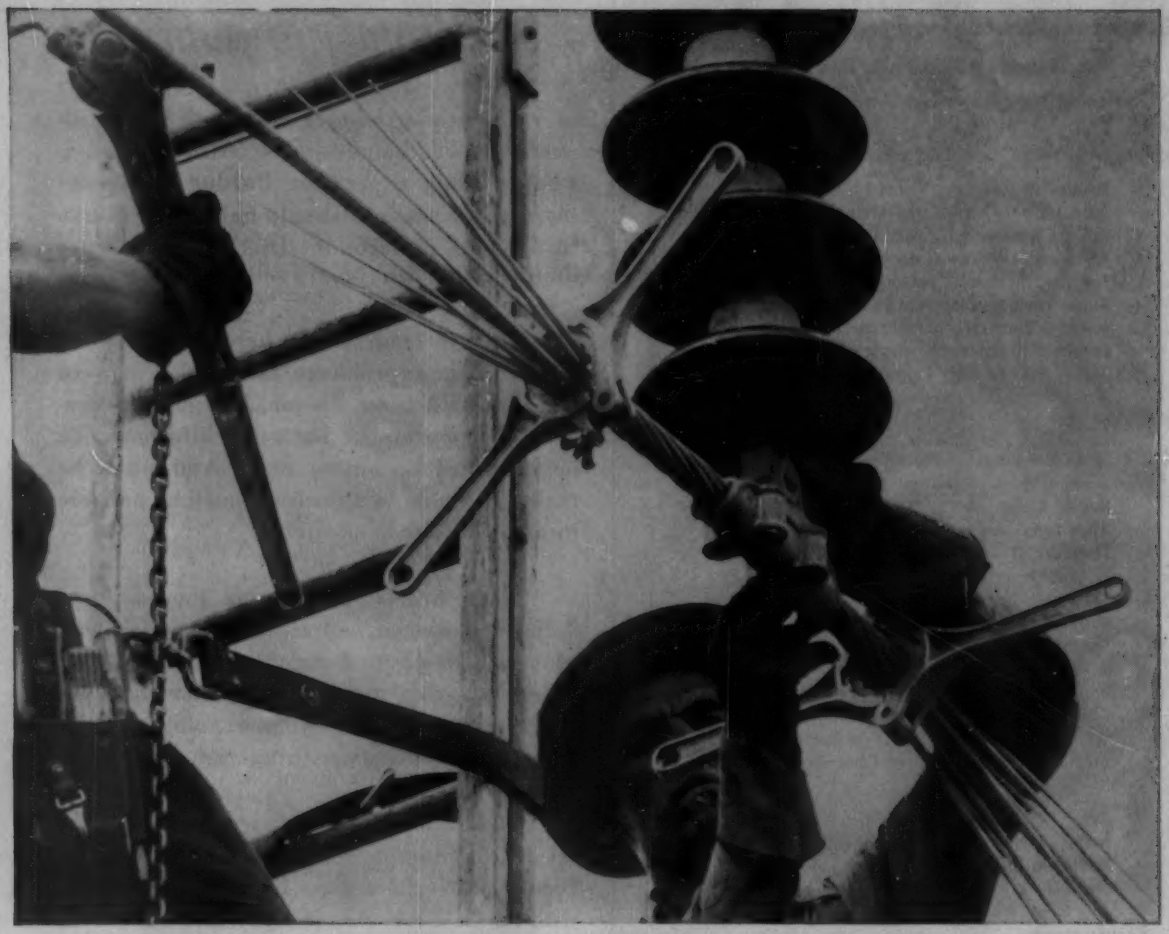


Small cost, big importance

. . . . mean there's more to insulator buying than comparing prices

Suspension insulators and hardware are important in operation of a transmission line, but they're a small part of the cost. In the budget for a new line, you'll find them down among the two to five per cent items. Meals and transportation usually cost more than insulators and hardware.

Viewed with this perspective, insulator price ceases to be a major consideration. Of more interest are the quality of the product and the record of the manufacturer. Whose products have the longest records of dependable performance? Who leads in research, design and production? Who understands best the relationship between hardware and insulators?

Answers to these questions point to the best insulator buy for the money, regardless of price. And they invariably point to Ohio Brass insulators and hardware.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

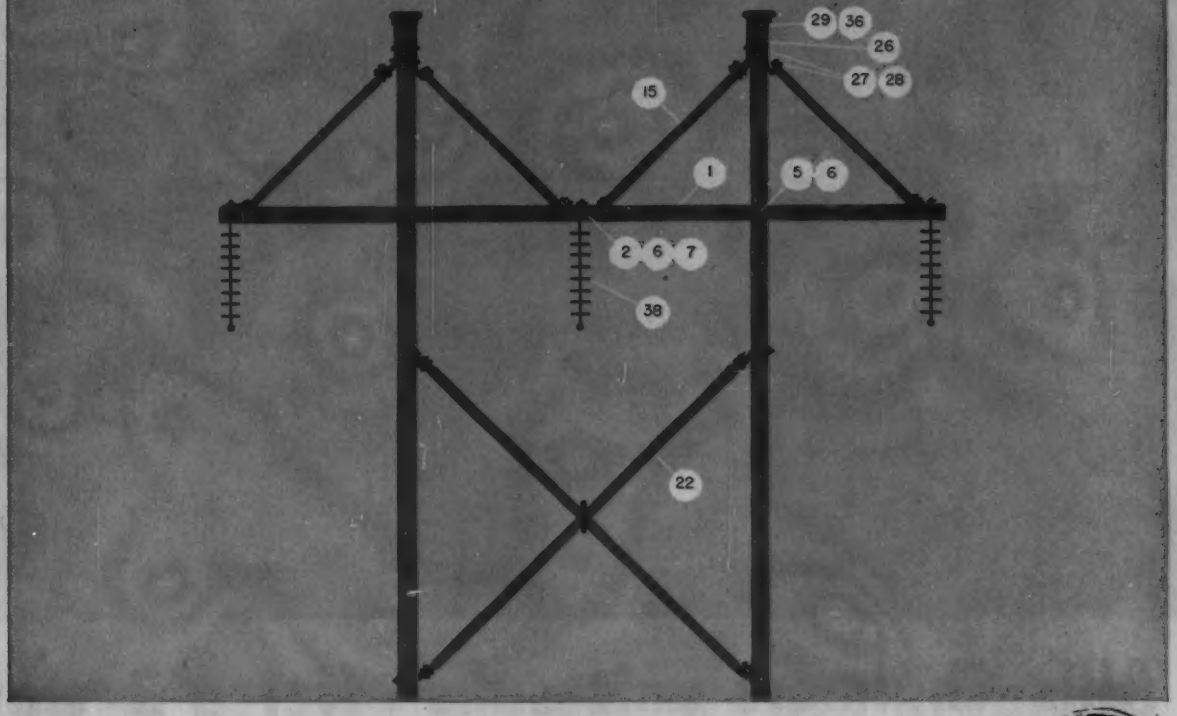
Ohio Brass

4736-H

TANGENT W/BRACES NO. 702

H-FRAME STRUCTURE, DOUBLE PLANK CROSSARMS WITH METAL SPACERS, POLE TOP STATIC WIRE SUPPORTS, AND WOOD CROSS BRACES DESIGNED FOR 69 TO 154 KV CONSTRUCTION

DRG. REF. #	QUANTITY	DESCRIPTION	DRG. REF. #	QUANTITY	DESCRIPTION
792	2	Pole	15	4	Vee brace 3⅛" x 4⅜" cross section
1	2	Crossarm	22	1 set	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
2	3	Steel spacer fitting w/mounting bolts	26	2	Static wire support
5	2	Stud bolt ⅞" w/washer nuts	27	4	Machine bolt ¾"
6	8	MF locknut ⅞"	28	4	MF locknut ¾"
7	1	Bent stud bolt ⅞" x 8" w/2 sq. nuts	29	2	Clevis
			36	2	Suspension clamp for static wire
7	2	Bent bolt ⅞" x 5½" w/sq. nut	38	As required	Suspension insulators and fittings



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The combination of top quality materials and specialized Graybar service can make a substantial contribution to simplifying your pole line projects. For example, take the structure illustrated here.

These complete cross-arm units are fabricated and fitted with hardware according to *your* specifications. Every pre-bored member fits perfectly. You reduce time consumed and cost of field assembly. You can plan on a far more smoother, efficient operation and completing the job on schedule.

Need assistance in solving tough or unusual problems? In addition to our regular service, Graybar Outside Construction specialists and field representatives are always ready to share with you their specialized knowledge.

For assistance, advice, complete quotations and the quality materials that assure uninterrupted service to your customers, make your next transmission or pole line order read "via Graybar".

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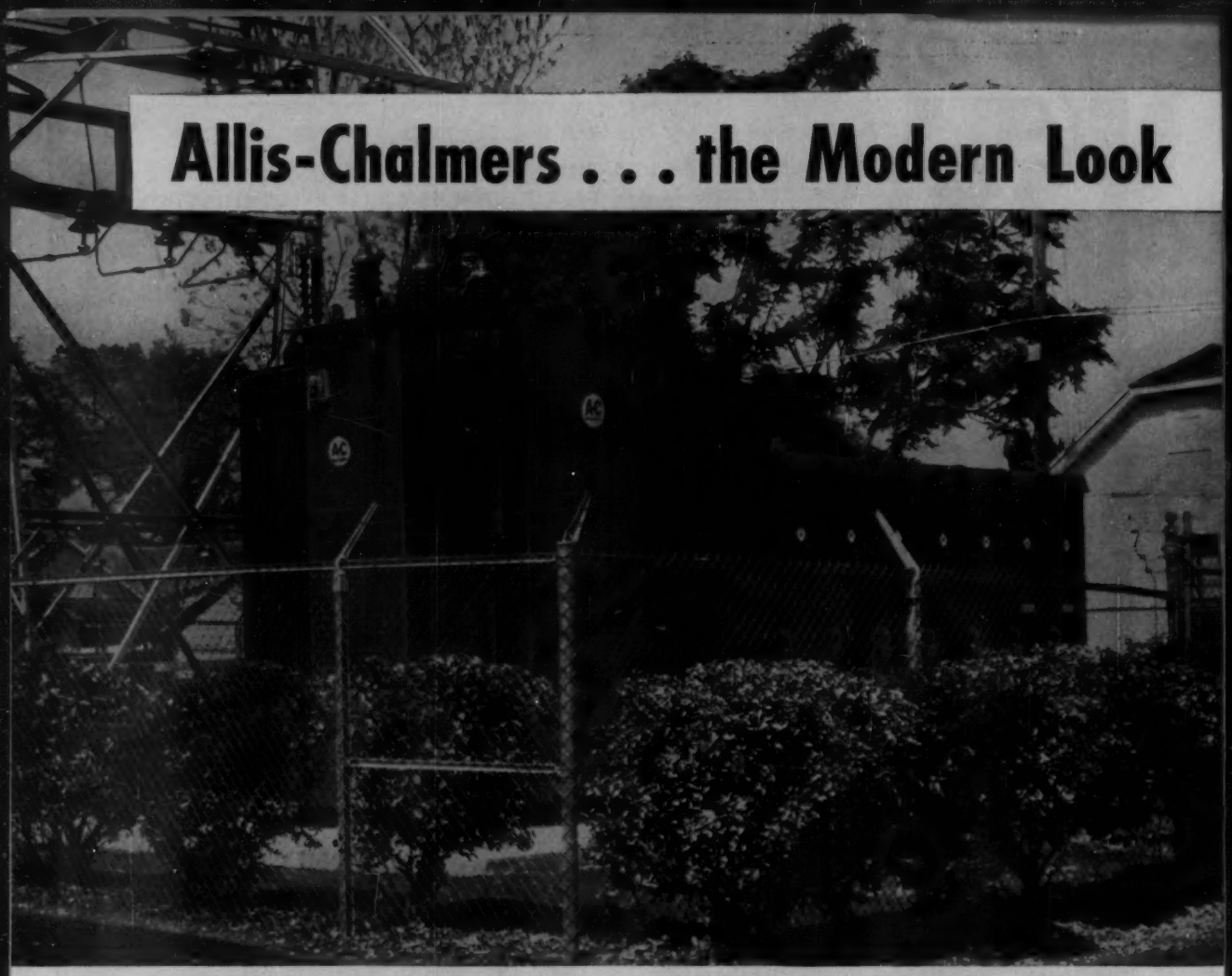


Allis-Chalmers . . . the Modern Look

Allis-Chalmers unit-subs offer a 3-way

Safety - Convenience

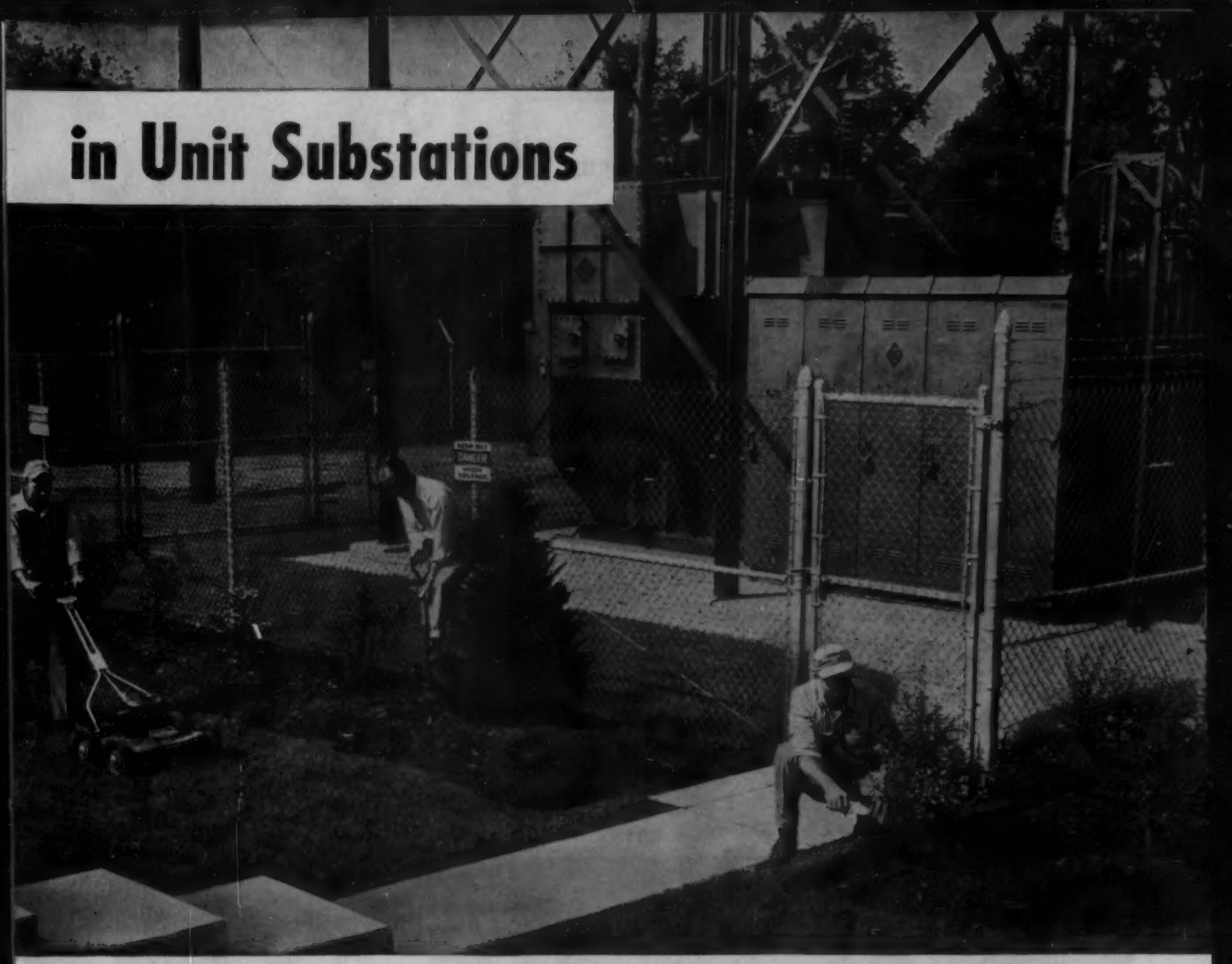
Safety—
Further improve your high safety standards with such features as:

- Mounting of potential and control transformers on drawout carriages for complete isolation of primary and secondary contacts during inspection.
- Automatic, positive-acting shutters to isolate high voltage contacts when breaker is withdrawn . . . *not dependent on springs or gravity.*
- Complete steel barrier compartmentation, flame retardent insulation, and safety interlocks.

Convenience—
Here's a typical convenience extra found in all types of Allis-Chalmers switchgear. You can move breaker to test, or even fully disconnected position inside cubicle . . . *and still close the door.* No special storage space is required for breakers not in use . . . handling is reduced.

ALLIS-

in Unit Substations



answer to your system growth problems

- Versatility

Versatility—

You can build *today* with an eye to the *future* with Allis-Chalmers standardized construction:

- Additional circuits may be added easily due to grouped control wiring... dry bus joint... jig-built construction.
- Transformers of larger capacity may be substituted without changing throats.
- Current transformers with higher ratios can be substituted. All have same mounting dimensions.
- Major components are interchangeable.

In addition, there's ease of installation, and extra reliability built into Allis-Chalmers switchgear. For the answer to your system growth problems, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

NATIONAL ELECTRICAL Week
FEB. 10-16, 1957

CHALMERS

A-C ALLIS-CHALMERS

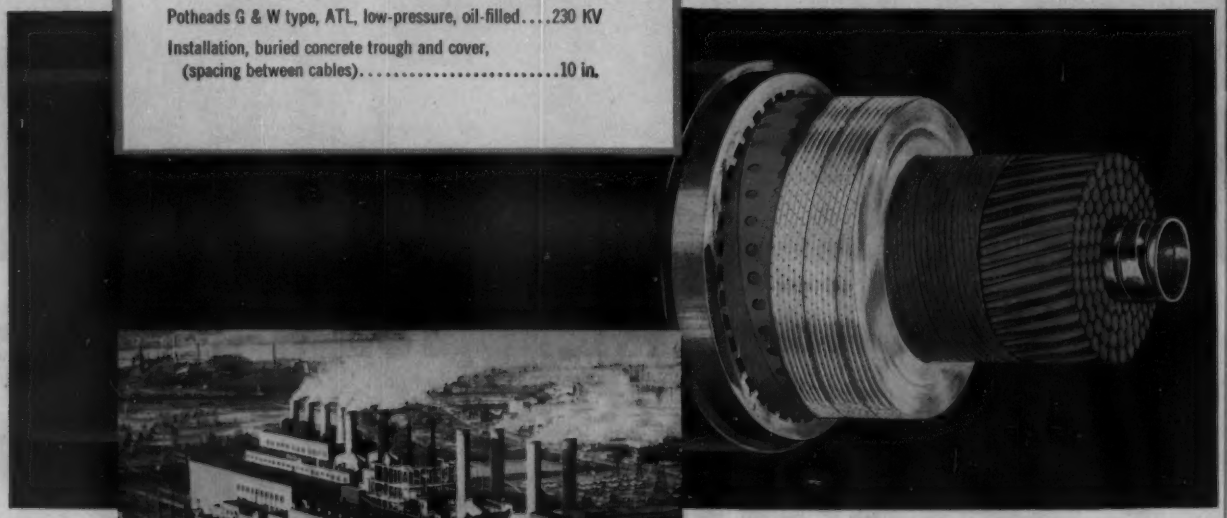
A-5147

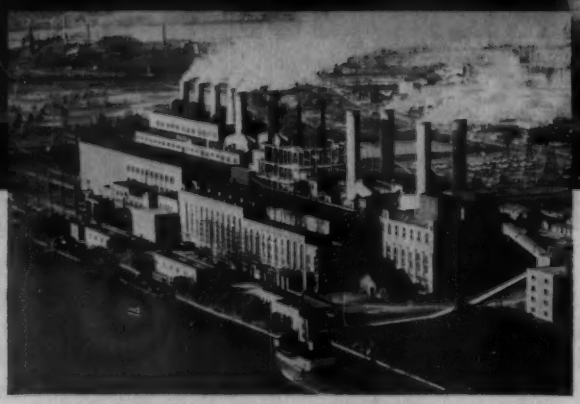
Phelps Dodge

FIRST 230-KV FOR

Circuit Data and Cable Rating

Type	Low-Pressure, Oil-Filled to AEIC 5th Edition
Cable Rating (nominal)	230 KV
Number of Circuits	2
Number of Cables	7
Capacity, each circuit (at 95% daily load cycle)	240,000 KVA
Length, each circuit (approx.)	1,500 feet
Cable construction	
Steel spiral hollow core I.D.	500 mils
Conductor concentric copper	1,250 M.C.M.
Impregnated wood pulp paper (nominal thickness)	835 mils
Habirloy arsenical fluted lead sheath (lead over flutes)	160 mils
Habirlene (polyethylene) jacket	115 mils
Maximum operating oil pressure	16 psi
Type CC oil reservoir each end, each cable	21 gals.
Maximum conductor copper temperature	
Normal	70° C
Emergency	75° C
Potheads G & W type, ATL, low-pressure, oil-filled	230 KV
Installation, buried concrete trough and cover, (spacing between cables)	10 in.





Cable will connect the main step-up power transformers to the 230-KV switchyard at Niagara Mohawk's Huntley Station shown here.

to make

LOW-PRESSURE, OIL-FILLED CABLE COMMERCIAL USE IN THE U.S.A.!

Output Circuit for Largest Unit of Niagara Mohawk Power Corporation Will Have Some New Features

Phelps Dodge Copper Products Corporation has been chosen by Niagara Mohawk Power Corporation to provide the first 230-KV low-pressure, oil-filled cable for commercial use in this country. The first 230-KV compression cable for use in the U. S., installed at Garrison Dam in North Dakota, is also a Phelps Dodge product.

The cables will be used to integrate new generating units into the Niagara Mohawk System by linking up the main step-up power transformers to the 230-KV switchyard at the Charles R. Huntley Station in Buffalo.

Cable specifications call for some of the longest low-pressure, oil-filled cable lengths ever made. Three single conductor cables are planned for each of two circuits, together with one spare cable. All cable lengths will be continuous without splices.

The cable design will include two unusual features: direct burial—a new installation method for this type of cable in the U. S.; and, for the first time anywhere on this class of cable, a protective jacket of corrosion-proof polyethylene will be used over the cable's lead sheath. Actual production of the cable will be preceded by the manufacture of a prototype cable and extensive testing. Present plans call for the cable to be installed during the early months of 1957.

PHELPS DODGE COPPER PRODUCTS CORPORATION

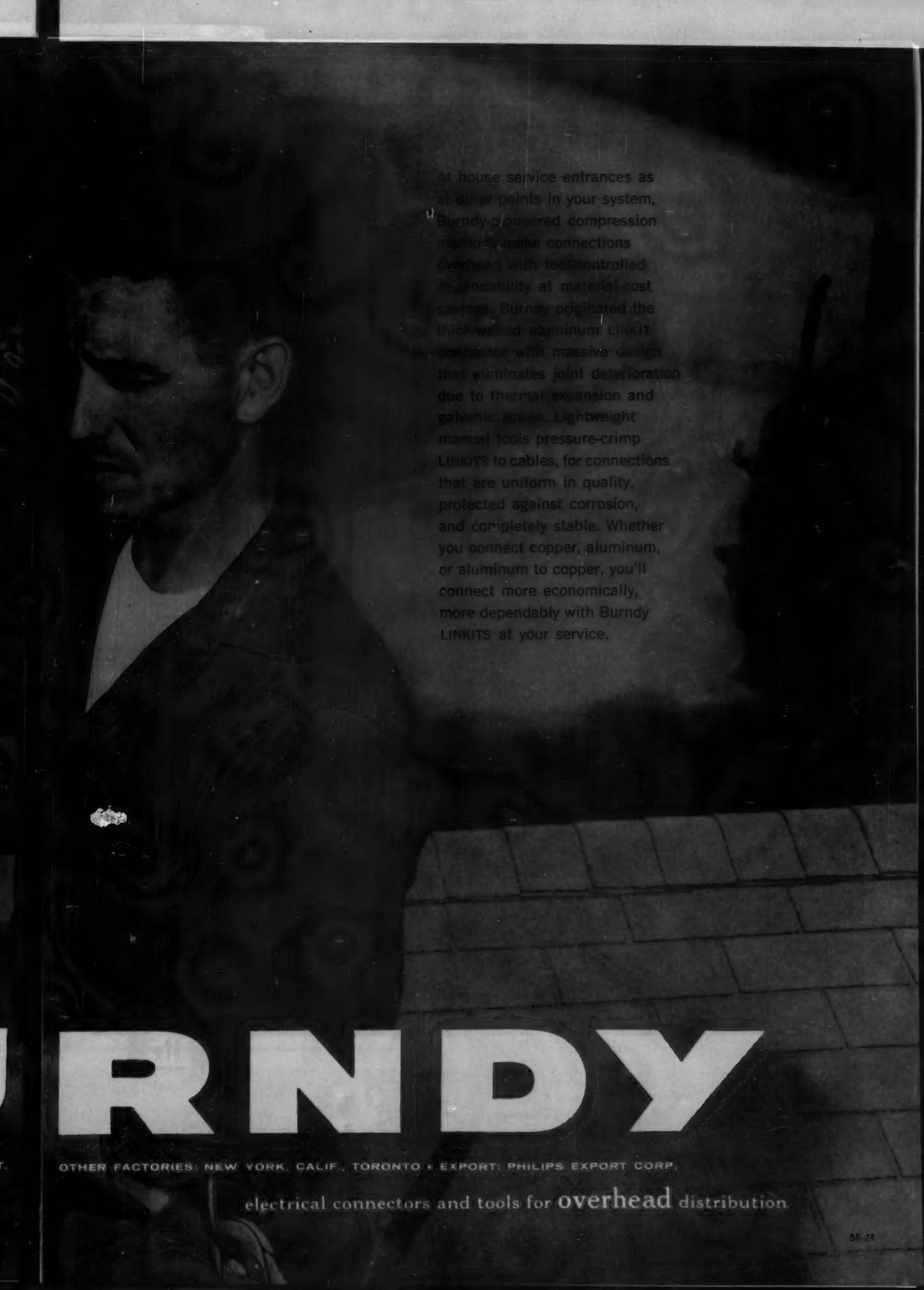
300 PARK AVENUE, NEW YORK 22, N. Y.

cost-cutting LINKITS . . .

at your service

BU

NORWALK, CONNECT.


At house service entrances as at other points in your system, Burndy-pioneered compression methods make connections overhead with tool-controlled dependability at material-cost savings. Burndy originated the thick-walled aluminum LINKIT connector with massive design that eliminates joint deterioration due to thermal expansion and galvanic action. Lightweight manual tools pressure-crimp LINKITS to cables, for connections that are uniform in quality, protected against corrosion, and completely stable. Whether you connect copper, aluminum, or aluminum to copper, you'll connect more economically, more dependably with Burndy LINKITS at your service.
RNDY
OTHER FACTORIES: NEW YORK, CALIF., TORONTO • EXPORT: PHILIPS EXPORT CORP.
electrical connectors and tools for overhead distribution
56-24

Wire Sculpture by Henry Szafarz

It's Another World . . .

one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

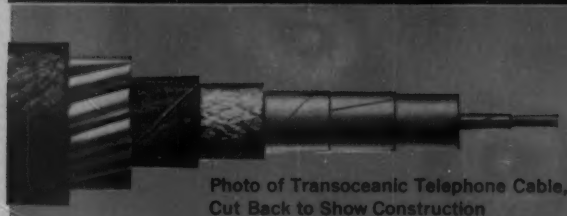


Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

Simplex

You get famous KEARNEY DEPENDABILITY with these field-proved TRIPOMATIC features

Exclusive housing construction—greatest possible weather protection! Lead-in connection terminals are isolated from the internal chamber of cut-out by a porcelain wall.

Hanger and contacts attached by *bolting*—eliminates all possibility of loosening or pulling out.

Three-point shock absorber consists of upper and lower contact springs and a tripping spring. The cable of the fuse link is automatically clamped under predetermined constant pressure without the use of thumbscrew or winged nut.

Movement of gas from lower contact to upper contact is restricted by means of interior box construction and collar around tube, preventing internal short circuits.

All live parts completely enclosed—door assembly is de-energized when in open position.

and . . . Field-Tested for full-rated performance. Interrupting Ratings of Tripomatics are proved by actual rigorous tests, under field conditions, at KEARNEY's Substation Laboratory.

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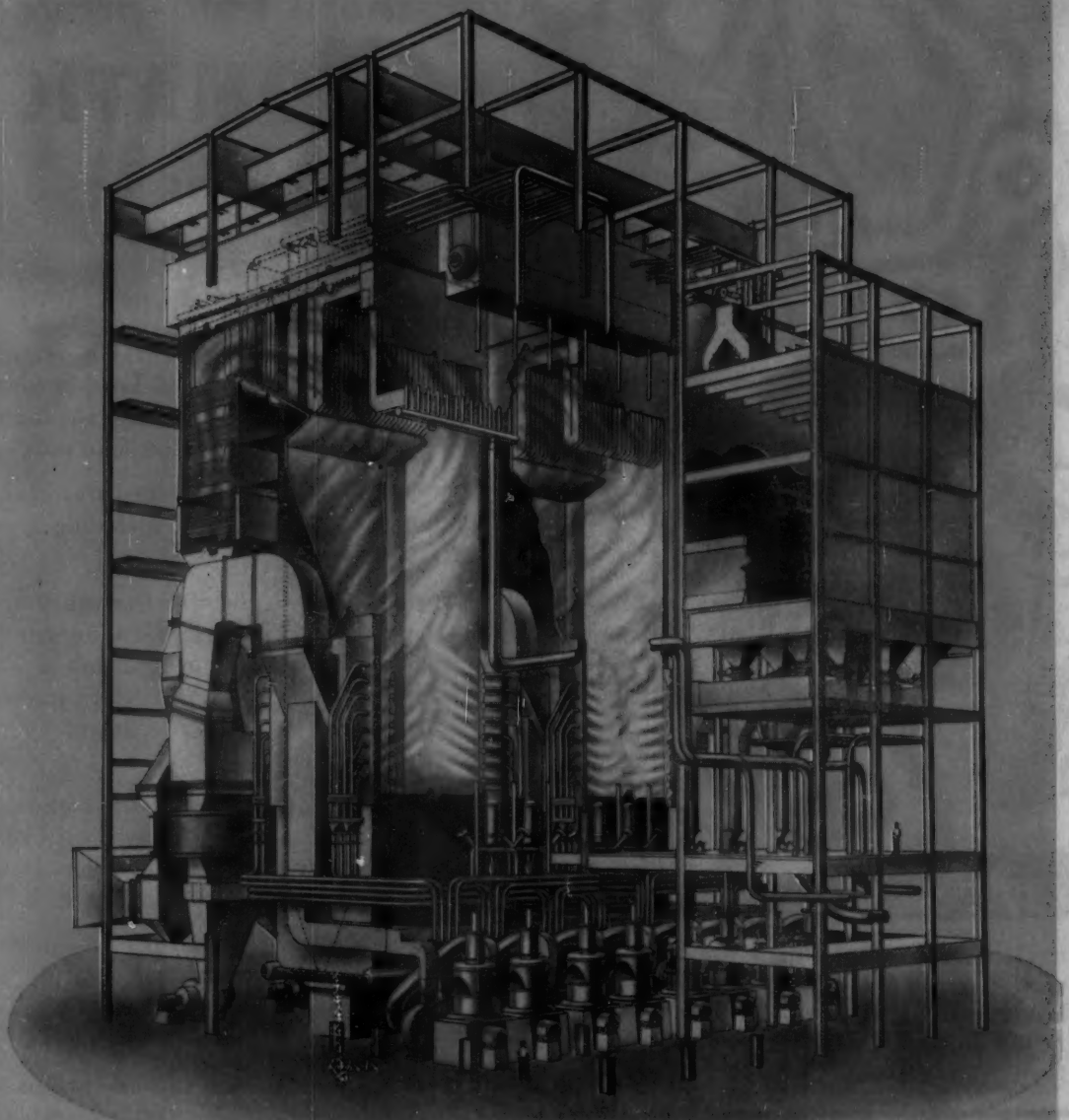
A PROVEN DESIGN FOR

It's C-E's Controlled Circulation Twin-Furnace



THE C-E CONTROLLED CIRCULATION TWIN-FURNACE BOILER

Presently there are 35 such units in service, under construction or on order. They range in size from 200 to 325 mw with design pressures from 2050 to 2750 psi. The first unit went into service in November, 1954. At present there are eleven units on the line.

BETTER BIG BOILERS

Boiler with Tilting Tangential Burners

EVER-BIGGER TURBINES ARE THE ORDER OF THE DAY...

What this means to boiler design is obvious. Boiler circulation . . . superheat control . . . reheat control . . . expansion . . . structural size and design . . . the relationship of furnace volume and geometry to heat absorption surface. . . . accessibility . . . all are factors that caused C-E engineers to take a new, long, hard look at big boiler design. The result is the C-E Controlled Circulation Twin-Furnace Boiler with Tilting Tangential Burners. Here are some of its advantages.

1. The principle of controlled circulation guarantees positive water supply to all boiler parts in both furnaces in exact accordance with their needs.
2. Superheater and reheater surfaces are in separate furnaces — each fired by tilting tangential burners. Regardless of load, superheat and reheat temperatures can be controlled independently and accurately.
3. The superheater furnace can be lit off independent of the reheat furnace and heated water can be circulated through both to establish equal expansion throughout.
4. The reheat furnace can be lit off after the turbine is rolling and after steam is flowing through it. Thus protection of reheater surface during start-ups is assured.
5. The volume of each furnace can be properly proportioned to the heating surface it contains without the use of internal dividing walls. All walls are accessible for cleaning.
6. Lighter structural members can be used since load concentrations and spans are considerably reduced using two smaller furnaces in place of one extremely large one.

The facts itemized above tell only part of the story. For instance, C-E Controlled Circulation Boilers offer greater design flexibility, faster load response, steadier water level, shorter outages for maintenance, quicker start-ups and numerous other advantages. The C-E Tilting Tangential Burner exerts tight control over superheat and reheat temperatures and minimizes the use of spray water for desuperheating.

In all, Controlled Circulation *plus* Twin Furnace Design *plus* Tilting Tangential Burners add up to the right answer for big boiler design.

C-E **COMBUSTION ENGINEERING**

B-954

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

STEAM GENERATING UNITS • NUCLEAR REACTORS • PAPER MILL EQUIPMENT • PULVERIZERS • FLASH DRYING SYSTEMS • PRESSURE VESSELS • HOME HEATING AND COOLING UNITS • DOMESTIC WATER HEATERS • SOIL PIPE

Now for "Preferred-Emergency" Switching

an Off-the-Shelf

AUTOMATIC TRANSFER PANEL

With *Any Desired* Throwover Scheme ...at the *Flip of a Switch!*

A Flip of the Switch Gives You:

- Choice of making either source preferred.
- Choice of automatic or manual (semi-automatic) return.
- Adjustable time delays —range up to 10 minutes.
- Optional manual operation of line switches.
- Choice of returning: in either open or closed transition (with or without paralleling).
- Optional lockout on bus faults.

Other Unique Features:

- Indicating lamps for switch positions, live sources, and lockout action.
- Alarm to prevent leaving panel set on "manual operation."
- Transparent cover over selector switches prevents unintended changes in settings.

Saves Time and Money

You don't have to design and build (or negotiate for) — your special automatic transfer panels in order to get the special specific throwover schemes you need. The new S&C Automatic Transfer Panel will give you any or all throwover options... selector switches give the scheme you want!

With this new stock panel you can eliminate the engineering and correspondence involved in getting custom-built panels.

Furthermore, you are sure of getting what you want today; tomorrow you can change your mind, and later you can revise the scheme—still using the same transfer panel. Imagine! You can order your panel ahead of time, before specifications are settled.

— Buy from our stock for your stock —

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POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶

Copper prices will settle down to around 30 to 32¢ per lb in 1957, predicts a cable manufacturer. That's 2 to 4¢ below last week's quotation, and one-third off last year's high. Government stockpiling commitments afford some price support to hold drop to 30¢.

Watch for electric companies in the Southeast area carrying a continuous full load on hydro units for the next two or three months because of the steady rain in the last month or so. This should indicate higher net earnings for these companies.

LATE NEWS ▶

Controversial proposal to sell 42% of St. Lawrence power to Niagara Mohawk Power Corp and Reynolds Metals is approved by N. Y. Attorney General Louis J. Lefkowitz. The ruling, requested by Daniel A. Gutman, Gov Harriman's counsel, supports the position of Power Authority Chairman Robert Moses.

Rep Carl Durham (D-N. C.) will push for passage of the federal liability insurance bill for nuclear power projects this year. Durham is Joint AEC head.

Revolution in electronics is predicted as result of newly developed cryotron. This tiny, simple device may replace expensive transistors and complex vacuum tubes. Its use in giant computers may shrink these units to one cubic foot. Cryotron is result of three years work by MIT Instructor Dudley A. Buck.

Southern California Edison gets PUC permission to charge rate surcharges for service from designated underground distribution systems (EW, Apr. 16, 1956, p 204). New rates are 5 mills/kwhr plus $4.25 monthly customer charge for residential; 1¢ per kwhr plus $8.00 monthly charge for most lighting and small power; and 5 mills/kwhr plus $1.70 per kw of demand billing plus a monthly customer charge of $8.00 for industrial.

"A lot of trouble and expense, but no immediate danger." This is how New York firms term current boat and barge strike. Con Ed and Long Island Lighting report ample coal stockpiles. Fuel will be conveyed to plants via truck. Major generation problems aren't expected unless strike runs two months or more.

SEC okays a plan under Holding Company Act by which Standard Gas & Electric will distribute to its stockholders a substantial portion of its interest in Duquesne Light and all its interest in Pittsburgh Railways Co.

In recent post card ballot, Winnetka (Ill.) villagers voted 2608 to 2387 to sell the 15,000-kw system to Commonwealth Edison for $4 million.

New England electric utilities project their 1945-1980 power supply program to 17.5 million kw, compared with 2.7-million kw as World War II ended. This means average investment of over $3 million weekly for almost 2,000 weeks.

The Live Better . . . Electrically Caravan, a GE contribution to the nationwide market development program, went on the road this week in Philadelphia. From Philly the 4-truck caravan leaves on a 10-month safari around the country, tying in with local home shows, state fairs, etc., during summer and fall.

Congratulations . . . John J. Burke is new president of Pacific Northwest Power Co. He succeeds Kinsey M. Robinson, Washington Water Power president and chairman, who now becomes a PNP chairman.

ELECTRICAL WEEK

A TWO-MINUTE

THE BIG ONE ▶ **How to best transmit power from tomorrow's plants to load centers?** This question provided an underlying theme for many papers presented at American Institute of Electrical Engineers Winter General Meeting. And discussions of extra-high voltage, bulk power substations, and system engineering were ones that attracted power men. Here are some highlights:
Research in Colorado will explore solutions to EHV transmission problems at 10,000-ft altitudes . . . Parameters of radio interference from h-v lines and methods of control are clarified . . . Wood spar H-frames are justified for 230-kv single-circuit lines . . . Microwave's advantages for relaying transmission networks are verified . . . Insulation coordination progress for h-v lines and substations is evaluated . . . Cut of up to 40 db of noise from substation transformers is achieved . . . Supervisory control for major switchyards at plants avoids congestion in control rooms . . . Automatic load control is economical for dispatch of a system with 35 generating units **(p 80).**

EVENTS ▶ **Some engineering jobs are going begging, say electric utility men,** but general manpower situation isn't critical. Informal survey of AIEEer's brought these suggestions: Aggressive salesmanship on industry's opportunities; technicians to handle detail; restore salary incentives; and enlist support of professors **(p 66).**

Nature throws a costly monkey wrench into Southern utility operations. Floods snuff out Appalachian Electric Power Co's 88,000-kw station at Logan, W. Va., and damage Kentucky Power Co distribution. In Arkansas Power & Light's northeast division, crewmen chip away to restore service to 13,000 customers when ice puts 800-miles of line in limbo **(p 69).**

EEI adds to nuclear power task force. Five new appointees will keep tabs on nuclear developments and work with any national reactor evaluation group that may be set up **(p 71).**

Insulating oils better suited to higher thermal and electrical stresses are being produced by cooperative research. This view and papers on testing and transmission were highlights of Doble Engineering Co's client conference. An assembly-line shop and a six-step process for reconditioning oil were described by Virginia E&P's C. R. Compton **(p 74).**

WASHINGTON ▶ **Hit tune in Congress could well be "Seems like old times . . ."** Familiar power bills like Hells Canyon, Niagara, TVA financing, and atomic development and liability insurance are back. But similarity to last year's Congressional make-up indicates much the same outcome for most of the legislation **(p 68).**

ATOMIC PROGRESS ▶ **Showdown on whether government or industry will develop atomic power** starts Feb. 19. Joint Committee on Atomic Energy begins hearings then. Democrats will back Sen Gore's proposal while Republicans plan to cite progress to date, charging the Gore plan is a cover-up for public power **(p 70).**

GENERATION ▶ **Construction men again prove "Necessity is the mother of invention."** When oil-hose booms needed repair at a Con Edison plant, two of the line department's "Skylift" trucks were used instead of scaffold. Construction crews fixed the booms in one-fifth the time scaffold construction would have required **(p 93).**

RELAYING ▶ **A 2,000-mc microwave system for a compact urban area has high reliability** and is economically justifiable. The system protects two 110-kv, pipe-type cables with a four-mile line-of-sight route. It consists of two parabolic antennae mounted on towers about 30 ft apart **(p 78).**

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

METERING ▶ **Mass production techniques pay off for new meter shop of Florida Power Corp.** Chain conveyor with 432 meter capacity, the latest in testing and maintenance equipment, and a comprehensive records section are features that are designed to handle requirements through 1965 **(p 76).**

SUBSTATIONS ▶ **Shield strapped over dummy breaker terminal compartments safeguards personnel** during transformer removal. The micarta device prevents accidental contact with portable cable terminals, which extend beyond some metal-clad draw-out breakers **(p 96).**

SELLING ▶ **Conveyor belts save a California poultryman an hour's labor every day.** Two endless belts handle "production" of 5,000 hens. Automatically controlled lighting stabilizes the hens' feeding day and automation also eliminates feeding chores **(p 100).**

Infrared lamps do a sweet job of drying saccharin tablets for a Norwich, N. Y., pharmaceutical firm. A 9-kw oven cuts labor costs in half, boosts output 50%, and produces a better pill. Lamps at the front of oven operate at full 230-v line voltage to up tablet temperature quickly **(p 106).**

MANAGEMENT ▶ **Planning a show on the industry's role in peace time uses of the atom?** Public Service Co of Colorado scores well with its "Fabulous Atom" production by pegging the script to audience interests and intelligence, and using varied visual demonstrations **(p 75).**

Security offerings slow down after a hectic January. The $12-million issue of Public Service Co of Oklahoma was a "loner" last week . . . Stockholder subscriptions went well for Niagara Mohawk Power and Southwestern Public Service **(p 131).**

PEOPLE ▶ **Puget Sound P&L promotes R. F. Plymire to vice president post.** He was former general commercial manager. Ralph M. Davis, previously chairman of Washington State PSC, is the new secretary replacing Walter S. Zachary, retired **(p 122).**

Edward M. Spencer is elected treasurer by Detroit Edison Co. He had served as treasurer of Atomic Power Development Association. Philip D. French is his new assistant **(p 122).**

MANUFACTURERS ▶ **Atomic power business is booming, Westinghouse press conference reveals.** Pres Gwilym Price says unfilled atomic equipment orders are up 213% over 1954. Large turbine schedule boards are full for 1957, almost 100% for 1958, and 75% for 1959, the company says **(p 116).**

Utilities may give gas turbines a bigger play for peak power generation in '57. General Electric Co says new applications last year increased 50% over 1955 gas turbine installations. GE is offering a line with 5,000 to 30,400-hp ratings, 4,750 to 21,800-kw output, and a variety of cycles **(p 116).**

NEW EQUIPMENT ▶ **A new single-phase, 14.4-kv, remote control oil switch** is designed for switching capacitors, outdoor lighting, and load break uses. It has continuous current rating of 200 amp and a momentary rating of 9,000 amp rms symmetrical . . . Big reductions in conductor clamp inventories are said to be possible with a series of aluminum electrical connectors. The U-bolt clamps can be used on ACSR from No. 2 to 715.5 Mcm and to 800 Mcm stranded **(p 108).**

ENGINEERING TRENDS

Time-delayed dropout of motor contactors cuts motor outages in critical process applications when system voltage is depressed momentarily by remote faults. According to proposals at the recent AIEE General Meeting, contactor coils held closed by rectified ac can be designed to hold in down to 35% voltage and, with an adjustable resistance in the circuit, to open only after 1/10 to ½ sec of low voltage.

Five-function computer saves $24,000 annually by facilitating more efficient coordination and dispatching of Public Service of Colorado's generating units. Exclusive feature claimed for this installation is including turbine back pressures in its computations. Savings are expected to reach $50,000 as the computer solves new problems of off-peak loading on this compact, 670-Mw system.

Capacitor banks to 200 Mvar are switched by 110-kv air-blast breakers without restrikes or unusual voltage distributions, according to *Brown, Boveri Review.*

Increasing use of electronic switching devices, current-limiting fuses, magnetic amplifiers, and gaseous discharge lamps accents the irregular currents they draw. At the recent AIEE meeting, GE's R. H. Kaufmann said these irregular wave shapes are mostly current-time or current-squared-time products which can be evaluated by dividing the overall wave into more familiar components. Steady-state current of a series of identical waves is computed by dividing the total current-squared-time of one wave by the frequency of repetition.

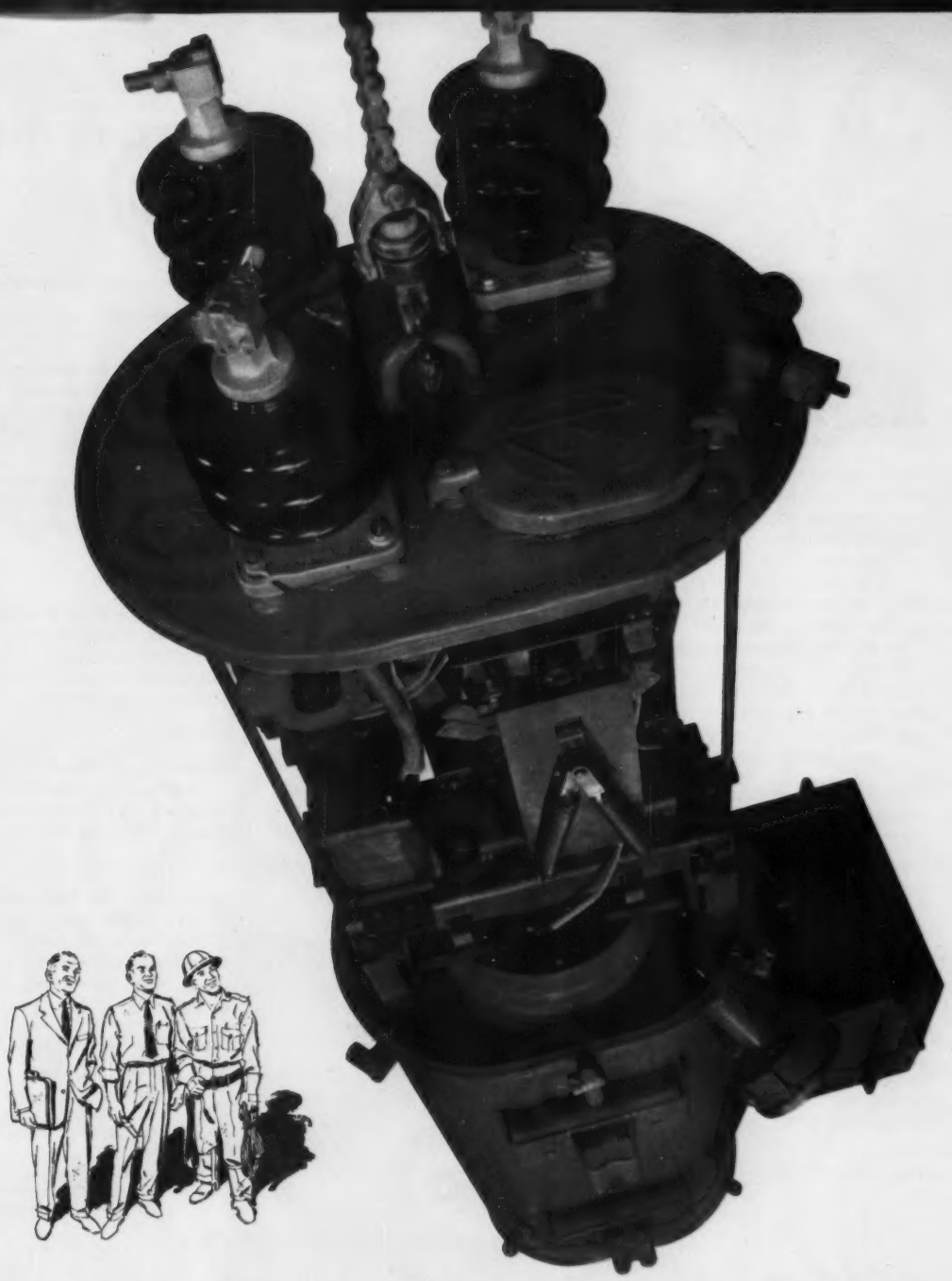
"Death of a Lineman" is the title of a new educational film designed to keep utility personnel alert to their occupational hazards. Now in preparation by EEI Accident Prevention Committee, the film is scheduled for release in April.

Down-under prepares for 330 kv transmission on 600-mi system. Initial operation of Australia's new lines will be at 132 kv.

FROM EDITORS IN THE FIELD

Tight-fitting caps protect transmission poles against top splitting and decay for Virginia E&P Co. Fabricated of roofing copper and heavy asphalt to shed moisture from the pole tops, they are credited with extending the useful life of 41 of 1,075 30-year-old poles inspected recently. The utility now plans to extend this capping practice to distribution poles.

Second 4/0 conductors will be added to 4/0 ACSR 115-kv lines to boost capacity by two utilities in the Southwest. One of these—Southwestern Public Service Co—will double conductor 35 mi of line in Texas to get nearly twice the capacity for the same losses. Bureau of Reclamation will add a conductor to 72 mi of line in New Mexico to more than double their capacity.



L-M's New 32-Step Regulator Combines All Desirable Features In One Unit

Some regulators have certain desirable features; some have others. Line Material engineers found that utility men were looking for a single regulator that combined *all* the advantages of *all* the various makes into one compact, efficient unit.

That is why L-M has designed this new 32-step regulator. This new unit combines all the desirable features found in all the standard makes—plus a few L-M "exclusives." It is extremely reliable, and, above all, provides accurate regulation.

LINE MATERIAL

A McGRAW-EDISON COMPANY DIVISION

L-M Announces A Major Improvement In 32-Step Pole-Type Regulators

by **N. K. DELANEY**
Product Manager, Capacitors and Regulators

Some regulator designs provide one advantage, some another. In developing a new 32-step regulator, L-M engineers were trying to provide utility men with what they had asked for—one unit that would provide all the performance of any and all other pole-type regulators—and would include all the best operating and convenience features available. This is what L-M's new regulator offers you.

In addition, because of their experience in the design of Round-Wound® transformers, L-M engineers are able to offer certain other advantages that are exclusive in the new L-M regulator. We believe these advantages are real—that they will be reflected in savings in installation, operation, and depreciation.

Round-Wound Design Offers Balanced Performance

L-M's exclusive Round-Wound core-coil assembly provides a balance of low copper loss, low exciting current, and low core loss. The round coils and long creepage distance between windings and leads provide a high uniform impulse level and high short-circuit strength.

Smooth Tap Changes . . . Long Life

L-M's tap-changing mechanism is designed to give the longest possible contact life. The movable contacts and the arcing tips of the stationary contacts are made of arc-resistant copper tungsten material. And, in operation, a reactor bridges across adjacent taps to permit smooth tap changes without current interruption or voltage dip. In addition, the speed of the tap changer is hydraulically controlled to assure minimum arcing and maximum contact life.

Sensitive Voltage Control

The heart of L-M's regulator control is a dependable induction disc-type contact-making voltmeter. It is a sensitive but rugged and easily adjustable device which is very responsive to voltage changes. The band width can be adjusted from plus and minus ¾ to plus and minus 6 volts. The range of regulation can be reduced externally without de-energizing the regulator. And by doing so, it is possible to increase the operating current up to 160% of its normal rating.

Simplified Maintenance

The complete internal assembly is cover-suspended to simplify untanking for periodic inspection and maintenance. This outstanding feature permits you to inspect all mechanical and electrical parts quickly and easily without draining oil or dismantling the unit.

Less Bending Moment on Pole

L-M's new 32-step regulator has an exclusive obround tank design. The unit is smaller, lighter and has shorter moment arm distance from the pole. This substantially decreases the total bending moment on the pole.

Get More Information

Read the detailed information on the following pages and you will see why we say: "L-M's new 32-step regulator is here with everything." And ask the L-M Field Engineer for bulletins and information on features, weights and dimensions. Or write Line Material Company, Milwaukee 1, Wisconsin.

Available Ratings

2500 volts. . . . 100, 150 and 200 amperes
5000 volts. . . . 50, 100, 150, 200 amperes
7620 volts. . . . 25, 50, 75, 100, 150 amperes

Compare All Five!...

See Why L-M's New 32-Step Regulator Gives You All The Features You Want—In One Unit!

	Make				
General	**L-M**	**A**	**B**	**C**	**D**
1. 32 5/8% steps	X	X	X		X
2. Plus and minus 10% range	X	X	X	X	X
3. ADD-Amp feature (under various names)	X	X	X		
4. Series arrester included	X	X	X		
Total Features	**4**	**4**	**4**	**1**	**2**
Transformer, Tanks, etc.					
1. Round-Wound transformer	X				
2. Obround tank	X				
3. Cover suspension	X		X		
4. Position indicator with drag hands and reset button	X	X	X	X	
5. Range-limit switches adjustable without de-energizing regulator	X	X			
Total Features	**5**	**2**	**2**	**1**	**0**

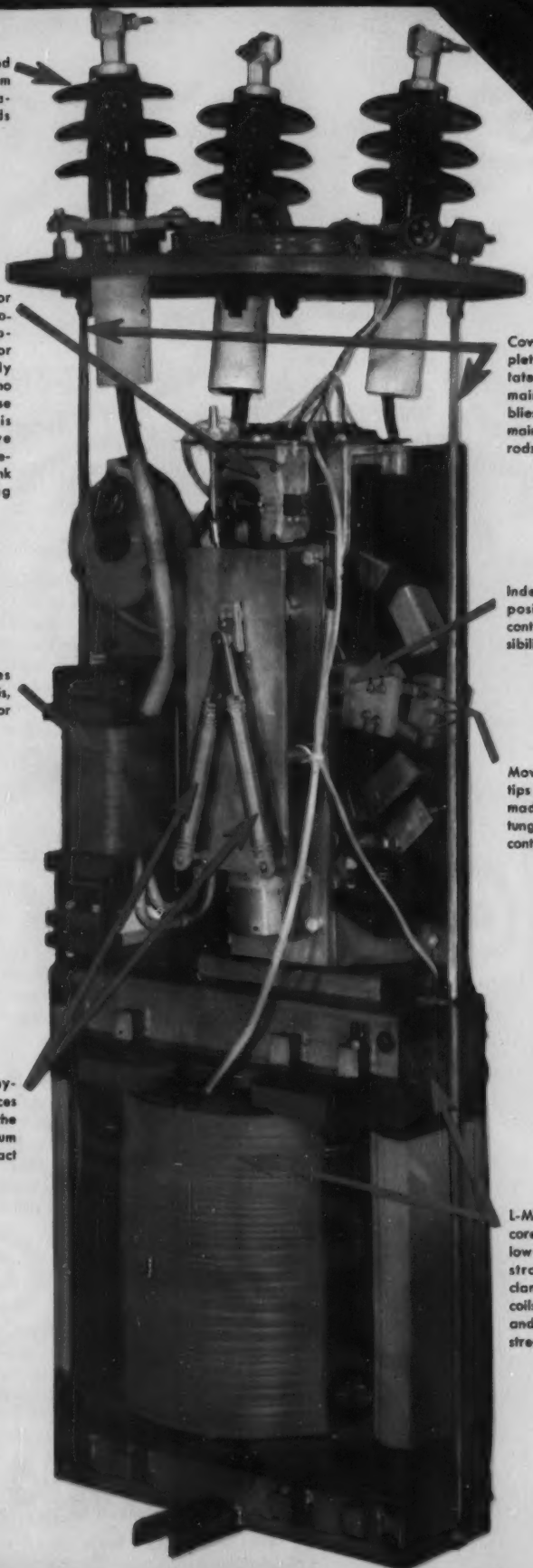
	Make				
Tap Changer	**L-M**	**A**	**B**	**C**	**D**
1. Single contact set	X	X	X		
2. Motor-spring drive	X	X	X		X
3. Index gear positioning	X	X	X	X	X
4. Controlled movable contact speed	X	X			
Total Features	**4**	**4**	**3**	**1**	**2**
Control					
1. Class 1 accuracy	X	X	X	X	
2. Induction disc-type voltmeter	X			X	
3. Integrating time delay	X	X	X		
4. Operation counter	X				X
5. Voltage level adjustment rheostat	X		X		X
6. Lightning arrester for control	X	X	X		
Total Features	**6**	**3**	**4**	**2**	**2**
SUMMARY OF FEATURES	**19**	**13**	**13**	**5**	**6**

Bushings are corona-free and are designed for minimum radio interference. Extra-long bushing shank extends well into the oil.

Capacitor-type drive motor loads the springs which provide the energy for tap-changing operations. Motor can be stalled indefinitely without injury. It requires no additional lubrication because it operates under oil. This simple and positive drive mechanism converts 360 degrees of rotation of the crank arm to one tap-changing operation.

Bridging reactor provides smooth tap changes—that is, without current interruption or voltage dip.

Drive springs house the hydraulic speed-control devices which govern the speed of the tap changer to assure minimum arcing and maximum contact life.



Cover suspension of the complete internal assembly facilitates periodic inspection and maintenance. All sub-assemblies are suspended from the main cover by steel support rods.

Index gear assures positive positioning of the movable contacts, eliminating the possibility of contact over-run.

Movable contacts and arcing tips of stationary contacts are made of arc-resistant copper-tungsten alloy to assure long contact life.

L-M's exclusive Round-Wound core-coil construction provides low losses. Round coils and strong steel frame, heavy clamping blocks and varnished coils prevent axial movement and assure high short-circuit strength.

LINE MATERIAL *Regulators*

A McGRAW-EDISON COMPANY DIVISION

Position Indicator Is Easy To Read

L-M's position indicator is oversize and is tilted so it's easy to read from the ground. The hands are brilliantly colored for better visibility. The drag hands (in red) indicate the buck and boost percent range to which the regulator has operated. They can be reset from the ground by simply pressing the reset button with a switch stick.

Plug-in Control Leads

All control leads terminate in a receptacle-type connector so the control can be easily removed if you want to mount it at the base of the pole. The controls are mounted in a weatherproof cabinet with stainless-steel hinges, so that they are very accessible.

L-M's New 32-Step Regulator Is Smaller, Lighter, Has Less Bending Moment On The Pole

L-M's exclusive obround tank design provides a smaller tank with less oil, resulting in a lighter, easier-to-handle regulator. The obround design also brings the center of gravity closer to the pole. This reduces the moment arm distance from the pole. This combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole.

A comparison with three other manufacturers shows that the desirable low-bending moment of L-M's new regulator is exceeded by as much as 136%

Compare Percent Bending Moment for 100 AMP regulators:

	Manufacturer			
Voltage Class	L-M	A	B	C
2500	100	167	236	184
5000	100	141	171	142
7620	100	137	173	153

Also, L-M's new 32-step regulator is shorter, and requires less pole space. L-M's new regulator is as much as 21 inches shorter than other regulators.

Faster Cooling

Cooling tubes on L-M's new 32-step regulator provide adequate cooling to maintain low hot-spot and top-oil temperatures. Transfer of heat from the copper to outside air is faster and more efficient because of reduced mass. Only L-M's new 32-step regulator has the obround tank design with these outstanding advantages: less height, less weight, and less bending moment on the pole.

Greater Current Capacity With ADD-AMP Feature

Regulating Range	Current Capacity
% "Raise" or "Lower"	Percentages of Rated Amperes
10	100
8¾	110
7½	120
6¼	135
5	160

As the table illustrates, reducing the range of regulation through five steps makes it possible to increase the load-carrying capacity of the regulator up to 160% of its normal rating.

LM®

LINE MATERIAL

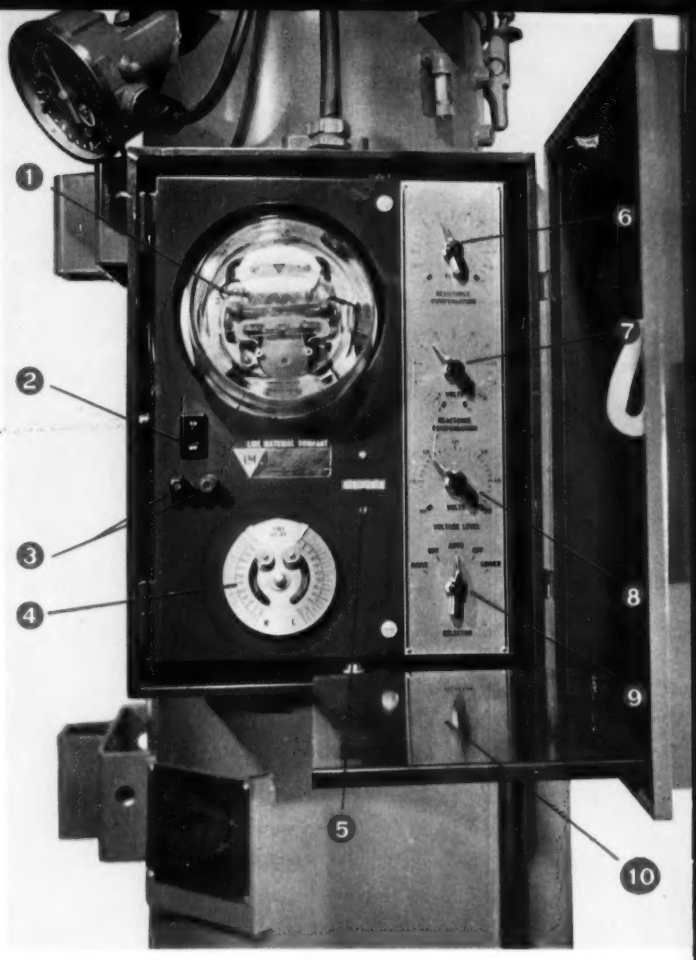
A McGRAW-EDISON COMPANY DIVISION

Regulators

L-M's New 32-Step Regulator Provides Sensitive Control With Integrated Time Delay

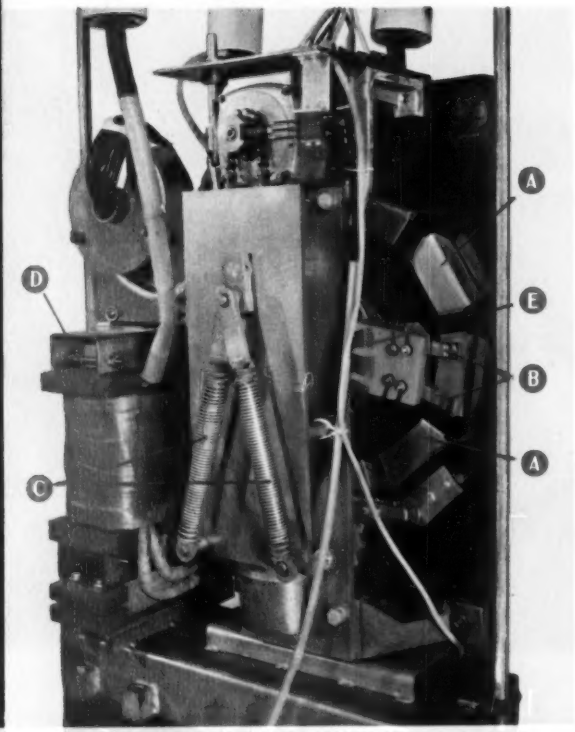
An induction disc-type contact-making voltmeter is used in L-M's voltage control to provide greater sensitivity. It also assures ease of adjusting the voltage level and band width. The band width on L-M's voltage control can be adjusted from plus and minus ¾ volt to plus and minus 6 volts.

The integrating time delay device will produce a tap change when the average time of voltage outside the band width exceeds that inside the band width. The integrating time delay can be adjusted independently on both "raise" and "lower" through a range of from 10 to 120 seconds.



All Components Are Readily Accessible For Setting Controls and Checking Operation

1. Induction disc-type contact-making voltmeter
2. Control power switch
3. Test terminals
4. Integrating time delay
5. Operation counter
6. Line drop compensator resistance setting
7. Line drop compensator reactance setting
8. Voltage level adjustment
9. Selector switch
10. Meter shelf



Smooth Tap Changes And Arc-Resistant Material Assure Maximum Contact Life

The movable contacts and the arcing tips of the stationary contacts are made of arc-resistant copper-tungsten alloy. In operation, the motor loads drive springs which provide the energy for the tap-changing operations. Hydraulic devices within the springs control speed of the tap changer. They provide optimum speed in making and breaking contacts, assure minimum arcing and maximum contact life.

In addition, a reactor bridged across the movable contacts provides smooth tap changes without current interruption or voltage dip. An index gear assures positive positioning of the movable contacts. There is no possibility of contact over-run.

A. Stationary contacts
B. Movable contacts
C. Drive springs
D. Reactor
E. Index gear

LM® **LINE MATERIAL**
A McGRAW-EDISON COMPANY DIVISION

Regulators

NO AGE-HARDENING PROBLEMS...

TELLURIUM LEAD ALLOY SHEATH...

ON ROEBLING PAPER POWER CABLE

Roebling electrical wire and cable are available with either copper or aluminum conductors.

FOR YEARS!

Even after 5½ years' aging—as proved by actual test—age-hardening is negligible in Roebling's special Tellurium Lead Alloy Sheath.

That's just one of the advantages of this new sheath that gives longer, better service. Excellent resistance to creep and fatigue are others. Combine the exceptional *outer* qualities of this sheath with the careful *inner* construction of Roebling Paper Power Cable and a unique, serviceable cable is the result.

Wherever maximum service life is required, specify Roebling Paper Power Cable with Tellurium Lead Alloy Sheath. For complete information, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Wagner replacement core and coils come ready to install in your old tanks...

fully tested....thoroughly dried....packed in oil!

Obsolete or burned-out transformers needn't be consigned to the scrap heap. With Wagner Form W Core and Coil Replacement Assemblies, these transformers can be made good as new again... *and up-rated at the same time* because the new preformed cores are considerably smaller than the old cores. These packaged replacement core and coil assemblies are factory-new elements, exactly like those used in new Wagner Transformers.

They come to you fully dried and tested—ready for use—protected in a sealed container filled with Wagner 7-NI inhibited transformer oil which you may also use in your tank. They are available in ratings from 3 through 167 kva.

Installation is easy... the assemblies are complete with terminal board or tap changer, with leads ready to install in your tank. Each assembly has a new serial number and name plate.

Wagner Bushing Assemblies

High Voltage Bushing Assembly

Available in cover-mounted or tank wall mounted types to meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping devices are included—fuses can be furnished when specified.

Low Voltage Bushing Assembly

Ready to install—includes porcelain bushing, gasket, solderless connector-type terminal and clamping device.

Field Repair Service for Substation Transformers

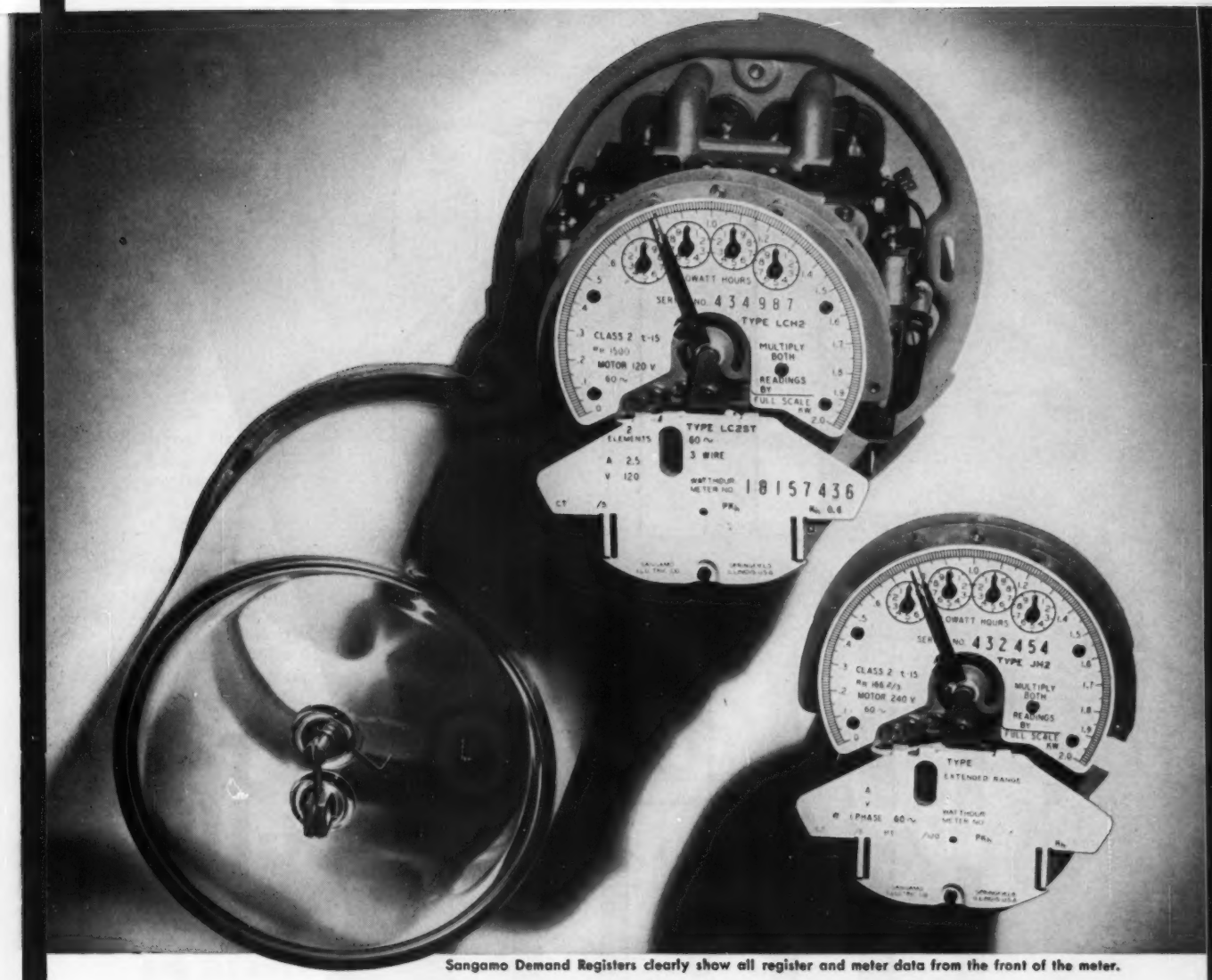
Wagner's Transformer Service Trucks—completely equipped for field repairs—each with the services of an expert—are available on schedule in most localities. The cost of this exclusive Wagner service is nominal—write for information.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



Sangamo Demand Registers clearly show all register and meter data from the front of the meter.

for low-cost mechanical demand metering use SANGAMO Demand Registers

- **Mechanical Demand Registers... both singlephase and polyphase.**
- **Can be field-installed on any modern Sangamo Watthour Meter.**
- **Require no lubrication. No preventive maintenance problems.**

Any modern Sangamo Watthour Meter can be quickly converted to a demand meter by replacing the standard register with a Sangamo Demand Register.

Sangamo Demand Registers are built to give many years of consistently accurate readings. Service experience has proved them capable of extremely long periods of troublefree operation.

This long service life is due to: 1. The Sangamo slow-speed (450 rpm), high-torque motor. 2. Timing gear shafts with hardened, polished stainless steel pivots which turn in vacuum-impregnated porous bronze bearings. 3. The use of jewelled and nylon thrust bearings. 4. The dependable, clutch-free gravity reset mechanism.

For more information, write for Descriptive Bulletins 311 and 312 and for Service Manual 390.

Live Better Electrically

SANGAMO

SANGAMO ELECTRIC COMPANY

Springfield, Illinois

SM56-9

IT'S HIGH TIME for

STOP AND THINK OF THIS FOR A MINUTE . . . .

ALL THE WAY FROM 23 KV TO 230 KV — INCLUDING BOTH TRANSFORMERS AND CIRCUIT BREAKERS — FOR THE FULL RANGE OF OIL LEVELS — THERE WILL BE ONLY 36 ASA STANDARD BUSHINGS!

Not long ago, the equivalent list of O-B bushings comprised over a thousand items. Other bushing manufacturers had similar or larger lists. There was no intended interchangeability. For practical purposes, you could add them all up.

Controlling costs in such a helter-skelter market was impossible. Deliveries were disappointing. Spare bushings were bought by the hundreds, carried in power company inventories, and often scrapped without a day of service when the "parent" piece of apparatus was retired.

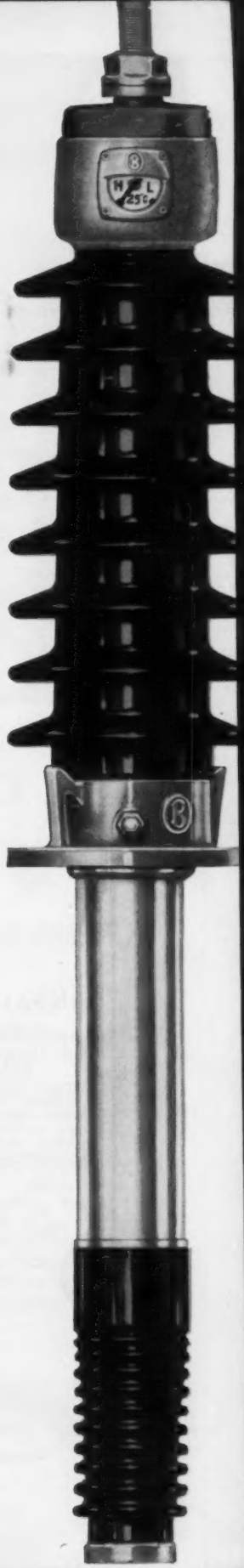
We ask you, "ISN'T IT HIGH TIME TO DO SOMETHING ABOUT THIS?"

Under a standard, a very few spare bushings — an absolute minimum — can protect all station apparatus of a given voltage. These spare bushings will not be subject to artificial obsolescence as certain pieces of equipment may go out of service. Being fully interchangeable, they will have universal application for the present and the future. There is an opportunity here for a substantial financial saving. Perhaps you may not appreciate the number of dollars involved until you make a quick check of the "frozen" bushing inventory on your own system. The figure may be surprising.

Under the standard, you are not limited to any single make of apparatus or bushing, since all standard bushings are interchangeable.

Older equipment, built prior to standards and still with many years of usefulness remaining, will share in the benefits of bushing standardization. The standard declares a sharp trend toward reduced outside diameters and, therefore, such bushings will usually fit older apparatus tanks with room to spare. Simple adaptations may be needed to compensate for the difference, but these are not complicated nor costly.

a Bushing Standard



HOW FAR AWAY IS THE ASA STANDARD BUSHING? . . . .

From 23 to 69 kv, inclusive, the standard is now in effect. Above 69 kv, in the range of high voltages, we are at the threshold of adoption. An indication of active interest on the part of electric power companies might even hasten the day.

This being the case, why do we belabor the question in public print? Because of one very important fact. NO STANDARD IS MANDATORY!

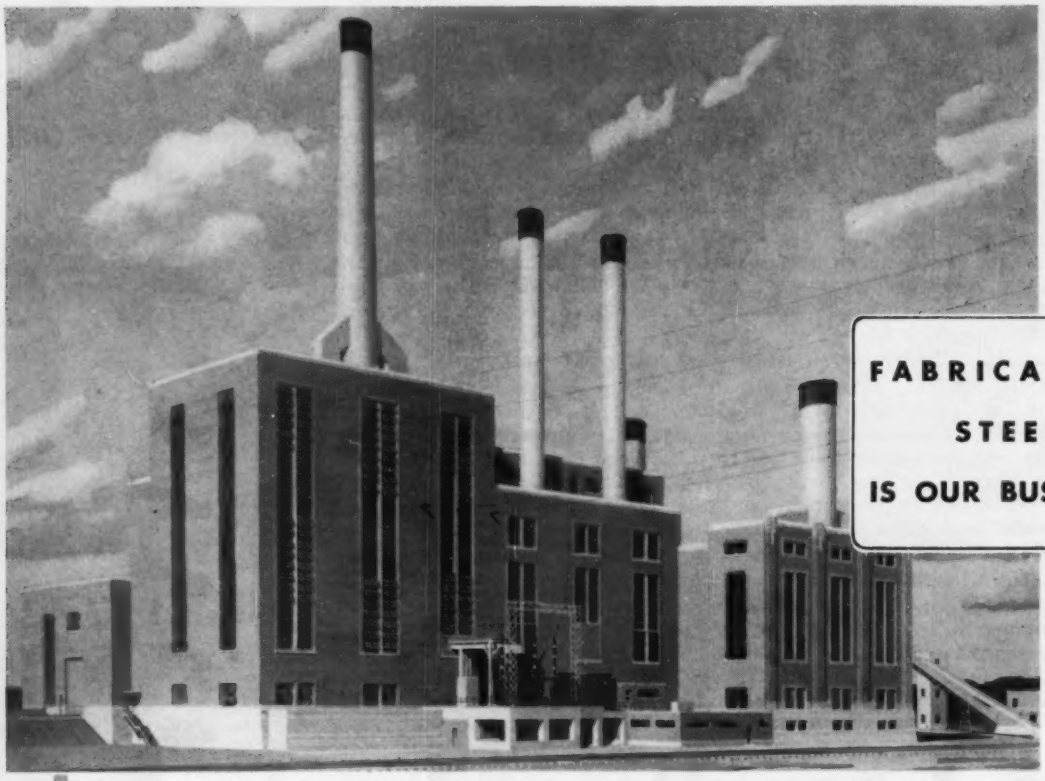
With the machinery at hand to simplify a hitherto wasteful and confusing situation, there is still only one way to make that machinery run. This consists of support — support from the individual power company whose dollar buys these bushings. Manufacturers, such as ourselves, must make what you order. Such orders can be aligned with standards, or can be in violation of them — we will still make the bushings. But, speaking from nearly 50 years' experience and close association with the bushing business, a great opportunity will be lost if standards are not given whole-hearted support.

This is relatively easy. Simply specify ASA standard bushings on all new station equipment. You can wisely go one step further and include "O-B," since standards assure only interchangeability — not service life or any other element of field performance, for which our new bushings have been so carefully engineered.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Ohio Brass

4789-H



FABRICATING STEEL IS OUR BUSINESS

Sargent & Lundy, Engineers

"SHOWPLACE" WITH A BACKBONE OF STEEL!

1900 tons of fabricated steel by Ingalls provides a substantial framework for the addition of Unit No. 4 to the beautiful Grand Tower Power Station of Central Illinois Public Service Company. This modern Power Station is considered, by many, as one of the finest examples of architecture of this particular type. The fabricated steel was erected by The Ingalls Steel Construction Company.

Thousands of commercial and industrial buildings are standing proof of Ingalls skill and ability to meet any steel requirement, regardless of size, type or location.

Ingalls can serve you better . . . for complete information regarding *why* and *how*, write:

INGALLS' PLANTS GREATLY EXPANDED

Capacity has been increased nearly 70% at Ingalls' Plants within the past three years . . . part of a program designed to give Ingalls the facilities to meet every modern requirement for fabricated structural steel for any construction purpose.

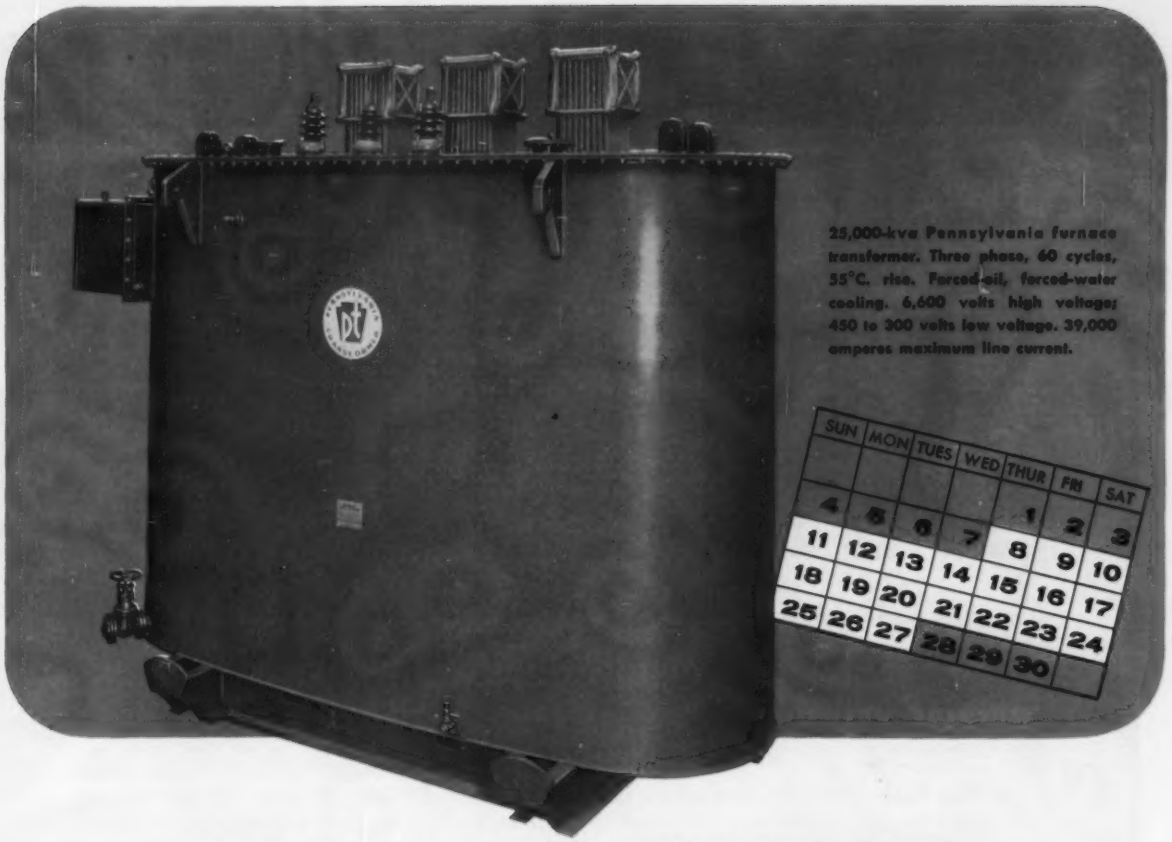
THE INGALLS IRON WORKS COMPANY

Established 1910

BIRMINGHAM, ALABAMA

Plants: Birmingham, Ala., Verona, Pa., North Birmingham, Ala., Decatur, Ala., Pascagoula, Miss.

FABRICATED STEEL for Power Plants • Hangars • Stadia • Stores • Bridges • Office Buildings • Theatres • Hotels • Apartment Houses • Hospitals • Churches • Schools • Industrial Buildings • Tanks • Bins • Pressure Vessels • Stacks



25,000-kva Pennsylvania furnace transformer. Three phase, 60 cycles, 55°C. rise. Forced-oil, forced-water cooling. 6,600 volts high voltage; 450 to 300 volts low voltage. 39,000 amperes maximum line current.

BUILT and SHIPPED in *20 Calendar Days!*

25,000 KVA FURNACE TRANSFORMER

by Pennsylvania

Even the *promised* shipping date of four weeks looked like excellent service to the West Coast steelmaker — and yet Pennsylvania was able to cut the allotted production time by more than one-fourth! As a result, the electric steel furnace for which this 25,000-kva replacement unit was built was put back into service even sooner than expected, and several days of costly downtime were averted.

Throughout the years, Pennsylvania Transformer has established a nation-wide reputation for tackling — and solving — the most difficult transformer problems, whether they involve short-time delivery or special design requirements. Particularly in the highly demanding furnace transformer field has this been true. Only recently Pennsylvania designed and built a record-breaking 82,000-ampere unit . . . and more than once have furnace transformers with special requirements been designed, built and shipped in less than two months.

Of course it takes a lot of "everyday" know-how to accomplish the unusual, and Pennsylvania has designed and built virtually every size and type of furnace transformer now in use: from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Why not put this furnace transformer experience to work for you? Pennsylvania Transformer Company, A McGraw-Edison Company Division, Canonsburg, Pa.

PENNSYLVANIA PENNSYLVANIA TRANSFORMER **FURNACE TRANSFORMERS**

Get 3 Tanks for best protection

1

It Takes More Than One Tank for That Extra Margin of Protection

Here's big breaker construction in a small outdoor distribution breaker! It costs you no more, so why take less?

Compare this breaker with others of the same rating and see the difference. Allis-Chalmers breakers offer:

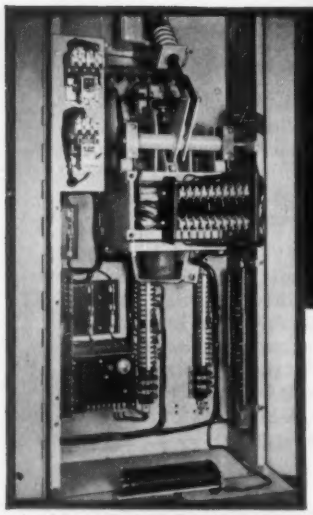
Tank-per-phase construction — Phases are completely isolated to eliminate internal phase-to-phase flashover and provide maximum protection on today's low reactance systems with their corresponding high fault currents.

Two vertical breaks per phase — Using time-tested *Ruptor* devices.

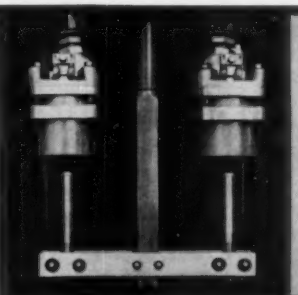
Standardized control wiring — Wiring meets NEMA and AEIC standards. Permits breaker to be moved from one location to another without the need for complete rewiring, as in the past.

Get More Information! For the complete story call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

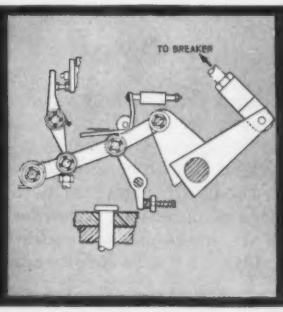
Ruptor is an Allis-Chalmers trademark.



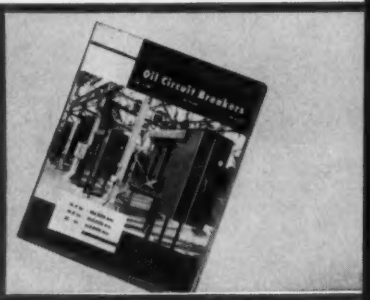
AEIC-NEMA standardized control wiring facilitates changing external control scheme to meet individual requirements without changing basic internal wiring scheme.



Two vertical internal breaks per phase... features time-proved, fully tested *Ruptor* interrupting devices with self-wiping, self-aligning tulip and bayonet contacts.



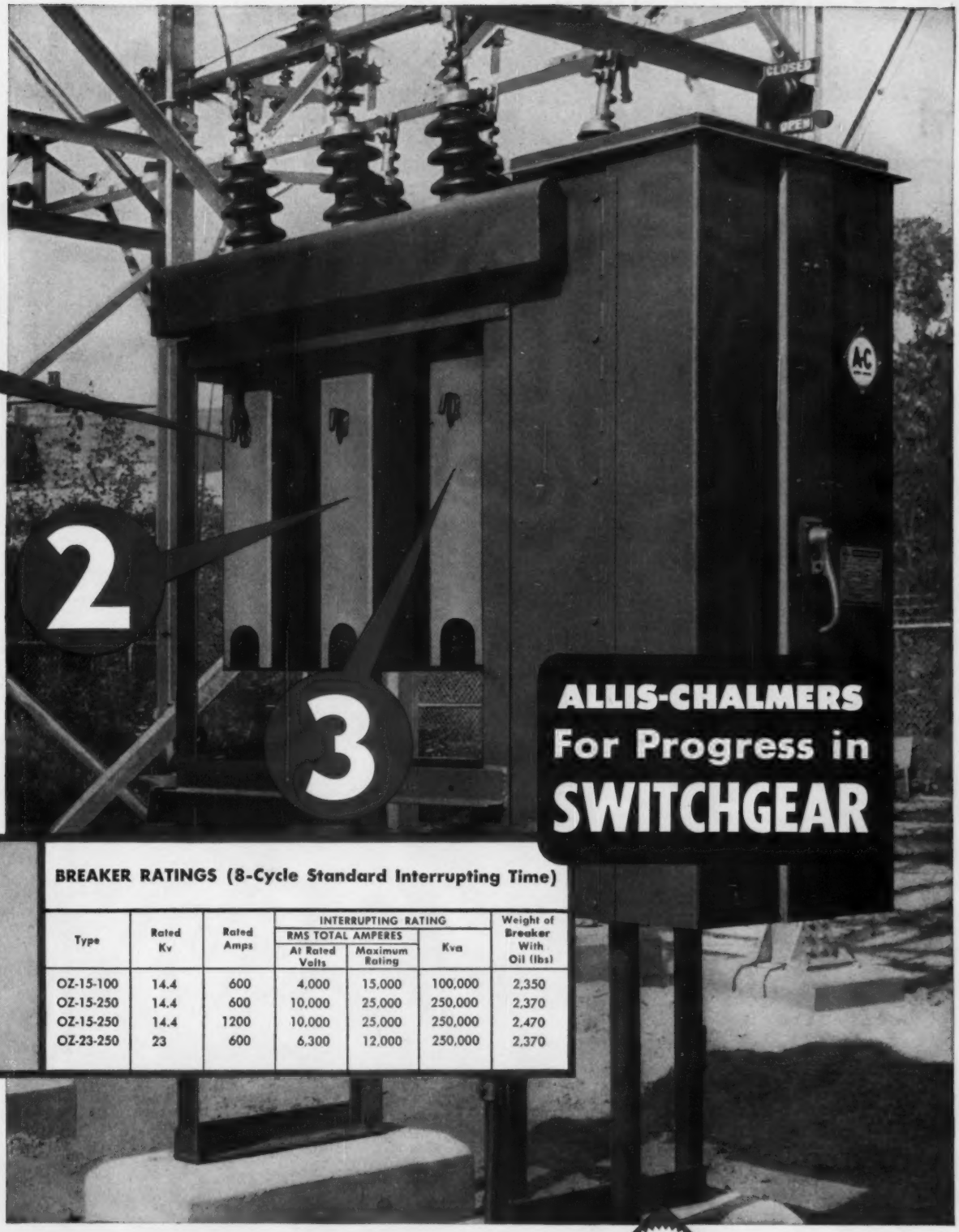
Four-bar linkage like ones on large A-C breakers provides mechanically trip-free operation. Simple solenoid operator—factory-set shim adjustments cut maintenance.



Eight-page bulletin 71B7946 tells the complete story. It shows the many quality features ordinarily found only in the larger breakers built into these units.

NATIONAL ELECTRICAL Week FEB. 10-16, 1957

ALLIS-



ALLIS-CHALMERS
For Progress in
SWITCHGEAR

BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Kv	Rated Amps	INTERRUPTING RATING			Weight of Breaker With Oil (lbs)
			RMS TOTAL AMPERES		Kva	
			At Rated Volts	Maximum Rating		
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

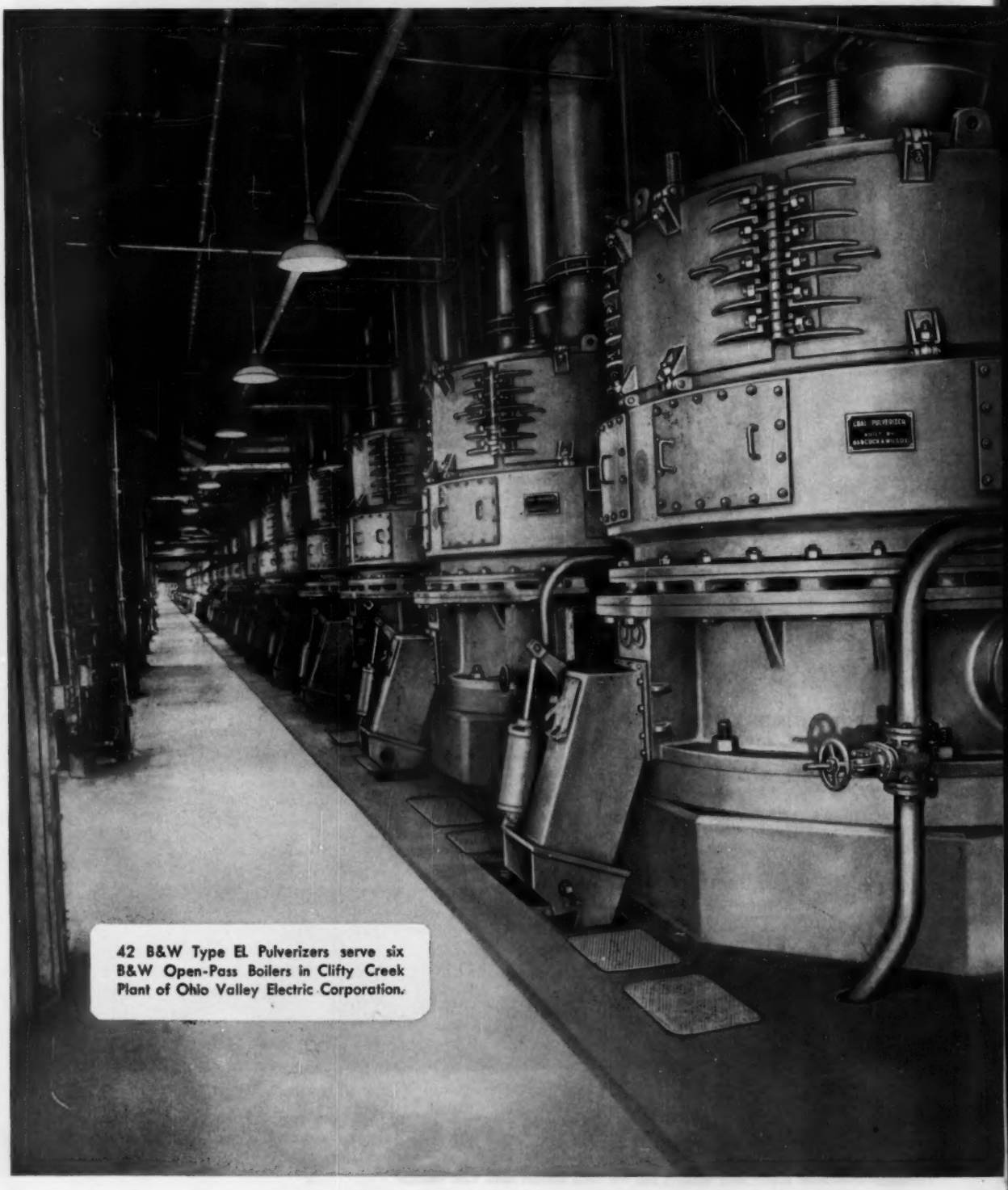
CHALMERS

A-C ALLIS CHALMERS

A-5144

Have You Investigated

THE MODERN B&W



42 B&W Type EL Pulverizers serve six B&W Open-Pass Boilers in Clifty Creek Plant of Ohio Valley Electric Corporation.

DIRECT-FIRING SYSTEM?

A Compact, Space-Saving Package of Efficient Grinding Power

More power and capacity in a compact arrangement . . . long-range dependability . . . reduced operating cost — these are the measurable results of continuous, intensive development of the modern B&W Pulverizer. It has established an outstanding production and efficiency record in thousands of commercial installations. Here are some reasons why:

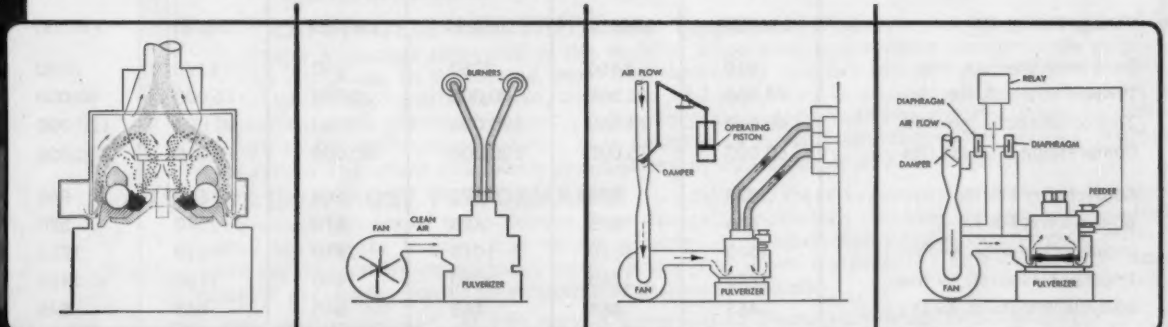
Continuous High Fineness Over Entire Service Life: Efficient combustion requires high fineness at all times. The high circulating load of the B&W Pulverizer permits efficient and dependable classification of product, so that only material of proper fineness leaves the unit. In addition, its slow-speed, spring-loaded ball bearing grinding elements maintain proper grinding contact throughout their service life.

Handles Wide Variety of Low Grade and Wet Coal: Regardless of the coal's grade or whether it's dry or soaking wet, the B&W Pulverizer's unique and exclusive recirculation of fuel through heated air assures efficient grinding . . . eliminates shutdown, capacity loss, or special attention from operators.

Simplicity of Arrangement and Reduced Maintenance: Accessibility for all normal maintenance makes it simple, quick, safe and low-cost. Adjustments are easily made while the unit is in operation. Using only clean primary air supplied under pressure, fan maintenance is substantially reduced and fuel piping is greatly simplified. Also, with the pulverizer acting as its own distributor, no special distributing devices are needed. Grinding elements are of special alloy material. They last two years or more on eastern coals and at least a year on midwestern coals.

Adaptable to All Types of Automatic Controls: Because it features "one point contact with the boiler," operation of the B&W Pulverizer is simple. The boiler's automatic combustion control is connected to the pulverizer at only one point—the damper in the primary-air duct. The pulverizer's own control system regulates all other functions, such as maintenance of proper fuel-air ratio and operating temperature.

SEND FOR DATA. For full information about the B&W Type EL Pulverizer and Pulverized-Fuel Firing Systems, write: The Babcock & Wilcox Company, 161 E. 42nd Street, New York 17, N. Y.



COAL RECIRCULATION — this means high fineness, aids drying.

PRESSURE SYSTEM — this eliminates fan wear, simplifies piping.

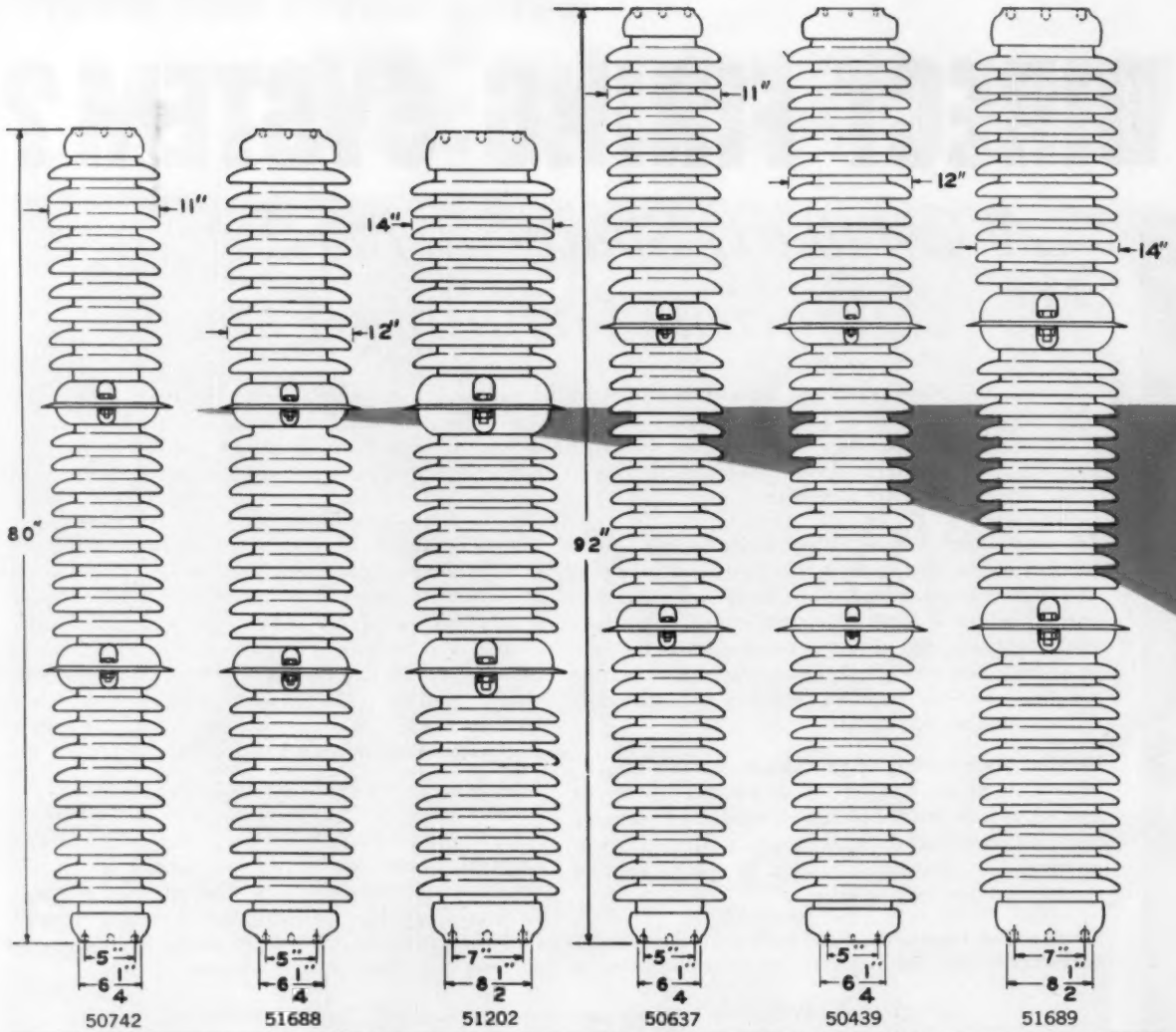
AIR CONTROL—this means one, simple control contact point.

MILL LEVEL CONTROL — this automatically adjusts fuel-feed.

BABCOCK & WILCOX

BOILER DIVISION

G-766



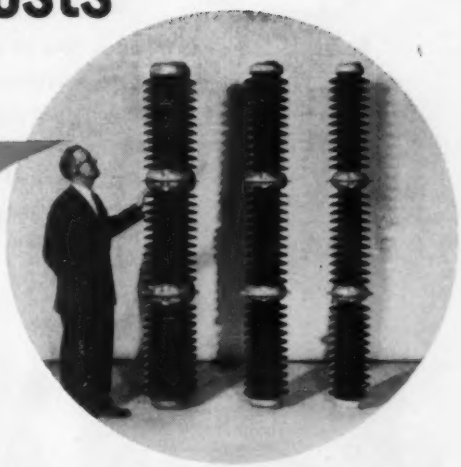
50742 51688 51202 50637 50439 51689

Catalog Number	50742	51688	51202	50637	50439	51689
Voltage Rating, Kv	196/230	196/230	196/230	230/287	230/287	230/287
Cantilever Strength, lbs.	910	1450	2750	750	1170	2300
Tension Strength, lbs.	20,000	25,000	40,000	20,000	25,000	40,000
Torsion Strength, inch-lbs.	40,000	90,000	120,000	40,000	90,000	120,000
Compression Strength, lbs.	60,000	75,000	100,000	60,000	75,000	100,000
60-Cycle Dry FO, Kv	575	575	575	660	660	660
60-cycle Wet FO, Kv	475	475	475	570	570	570
Impulse Flashover, Kv Pos.	1010	1010	1010	1210	1210	1210
Impulse Flashover, Kv Neg.	1240	1240	1240	1450	1450	1450
60-cycle Withstand, Kv Dry	465	465	465	545	545	545
60-cycle Withstand, Kv Wet	385	385	385	455	455	455
Impulse Withstand, Kv	900	900	900	1050	1050	1050
Test Voltage, Radio Infl.	125	125	125	146	146	146
Maximum RIV, Microvolts	500	500	500	500	500	500
Leakage Distance, in.	165	165	165	198	198	198
Dry Arcing Distance, in.	64	64	64	76	76	76
Net Weight, lbs.	310	370	580	360	430	645

ANNOUNCING

Lapp 230 Kv Station Posts

IN 3 STRENGTH RATINGS ...IN 2 BIL WITHSTAND RATINGS



To designers of stations at 230 Kv, Lapp offers its proved Station Post in two BIL series . . . 900 Kv withstand and 1050 Kv withstand . . . in standard strength, high strength, and in new extra-high strength that possess cantilever values greater than those of any switch and bus insulators ever offered before at this voltage.

EASIER, FASTER TO INSTALL Lapp high-voltage Station Posts cost less to assemble and handle than do conventional pin-cap stacks for switch and bus use. They weigh less and are composed of fewer sections. Stack for stack, a comparison with available conventional station insulators shows the Lapp Station Posts to be approximately 30% lighter in weight.

All Lapp 230 Kv Station Posts consist of three sections, each with caps cemented at the ends, and bolted together with four hex-head bolts. A total of eight bolts completes the assembly. End caps have standard bolt circles, require no sub-bases, spacers or adapters.

LAPP POSTS ARE *STIFFER* The Lapp Station Post unit is a one-piece porcelain post with caps cemented at the ends in large area, low tension compression grip . . . as compared to the nested porcelain shells and internal pin of conventional stacking units. Under cantilever load, deflection of Lapp Posts is considerably less than that of conventional pin-cap insulators; laboratory measurement shows the reduction in deflection to be approximately 50%. This increase in rigidity overcomes the serious problem of switch alignment commonly encountered by operators of 230 Kv substations.

STATION POST PERFORMANCE In addition, these insulators provide all the well-known advantages of Lapp Station Post design . . . porcelain cracking or puncture is eliminated because the hardware is on the outside . . . freedom from radio interference without need for conductive coatings . . . better service and lower maintenance cost under dirt conditions . . . greater resistance to arcover and mechanical attack.

At 230 Kv too, Lapp Station Posts provide an *extra* margin of operating security, low upkeep and long life.

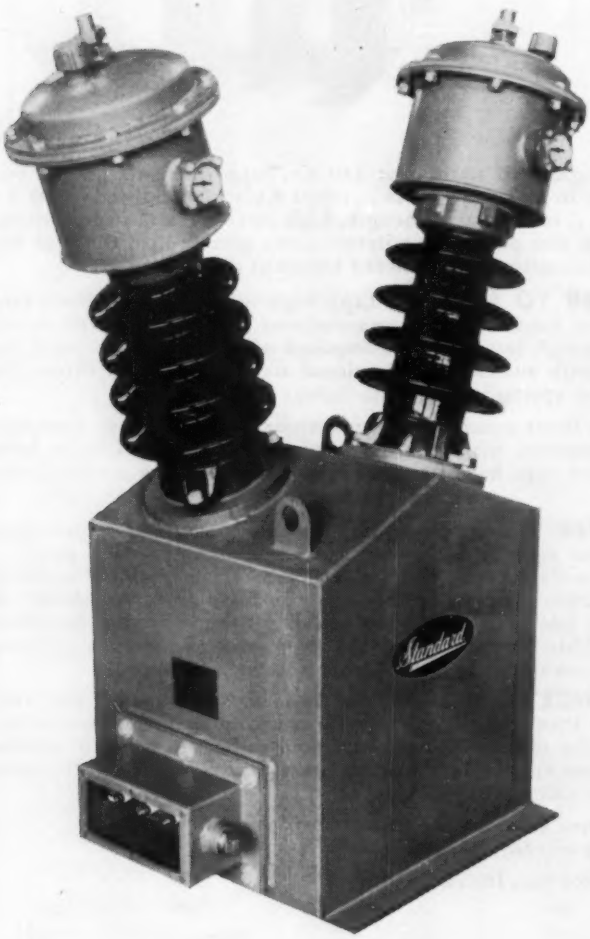
Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

NEW! Standard®

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. Most models can be mounted in any position.

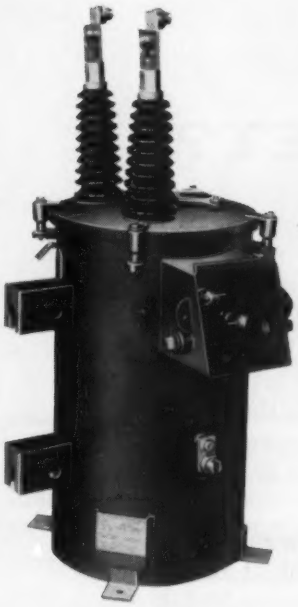
The new line meets all ASA, EEI, and NEMA mounting and accuracy standards. Transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard representative or write directly to us. You'll increase your accuracy at the point that counts—ahead of and at the meter!



TYPE PXO OISC POTENTIAL TRANSFORMER
— outdoor type. 34,500 volts primary, 120 volts secondary. For platform mounting.

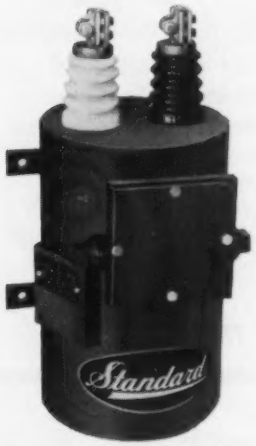
TYPE CXO OISC CURRENT TRANSFORMER
— outdoor type. 72,000 volts, 200/400 to 5 amperes, 350 KV FW impulse level. With oil level indicator, primary bypass protector, and secondary terminal box.

OUTDOOR METERING TRANSFORMERS



TYPE PWO OISC POTENTIAL TRANSFORMER— outdoor, 14,400 to 120 volts, 15 KV insulation class, 110 KV FW impulse level, pole or platform mounting.

TYPE OCO CURRENT TRANSFORMER — outdoor type, compound filled, for high accuracy relaying and metering service. 5 KV to 15 KV insulation class; 60 to 110 KV full wave impulse levels, 10 through 800 amperes.



TYPE PWD POTENTIAL TRANSFORMER — outdoor type. Compound filled. 2400 volts primary. Equipped with brackets for pole or cross-arm mounting. Secondary terminal chamber. Also available at 4800 volt rating, 60 KV impulse level.

TYPE CWD-1 CURRENT TRANSFORMER— outdoor type, compound filled, for 5000 volt service furnished in ratios 10 through 800 amperes.

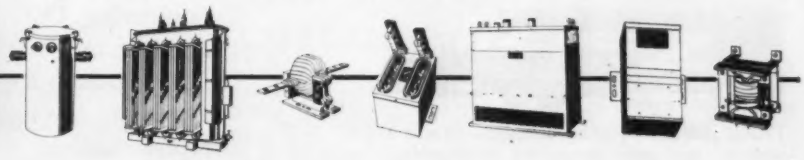
Standard®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Transformers FOR EVERY APPLICATION



A question for every electric utility

JUST HOW FLEXIBLE CAN POWER SUPPLY GET?

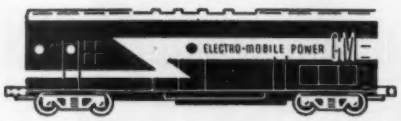
Giant strides to improve flexibility of supply to customers have been taken in recent decades by the electric utility industry. Today power availability must anticipate load growth more than ever before. Inter-connected supply permits transferal of power from one area to another as varying geographical load demands or emergency situations arise.

Even greater flexibility, however, can be attained—by means of Electro-Mobile Power. Truck-trailer or rail units permit shifting increments of power from place to place as demands change. Units can be used singly or in multiple—added like building blocks to match requirements exactly. And provision for impulse starting and stopping allows unattended operation from any location in the system.

Moreover, the placement of Electro-Mobile Power close to the load not only relieves the central station of a block of power, but also reduces the line loss between the central station and the load for that block of power. This is a major factor at time of peak.

Just how flexible can service get? Far more flexible than you might imagine with present equipment if Electro-Mobile Power is employed to answer additional requirements. A joint analysis of your system can reveal the savings and increased flexibility possible with these units. Contact your Electro-Motive representative for full information.

Electro-Mobile Power adds to system flexibility in many ways

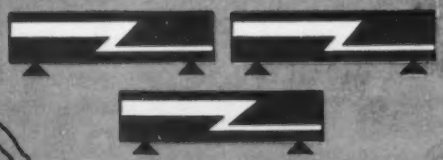


RAIL CAR—1000 kw units for use on sidings or placed on piers for semi-permanent use.

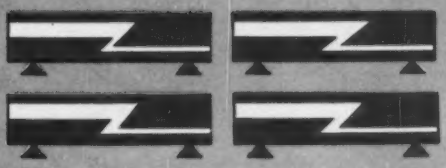
TRUCK TRAILER—500 kw units offer excellent mobility for many temporary applications.

Representative electric utility companies across the country are now providing better service to customers through the use of Electro-Mobile Power. This diagram is a composite of the different jobs these units, both truck-trailer and rail, are performing. Detailed information on these applications—operating costs, KWH produced, reason for use, location, etc.—are available through your Electro-Motive representative.

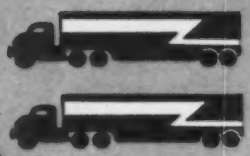
Rail units used for peaking.



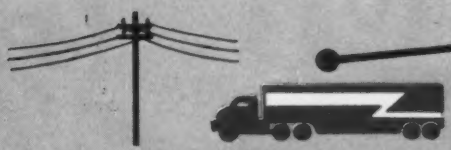
Rail units used for boosting.



Rail units used for temporary service during growth stage of new community. Units are added or subtracted until level is reached and permanent facilities can be erected in the most desirable location.



Mobile trailer units thrown into service during temporary outage caused by flood.

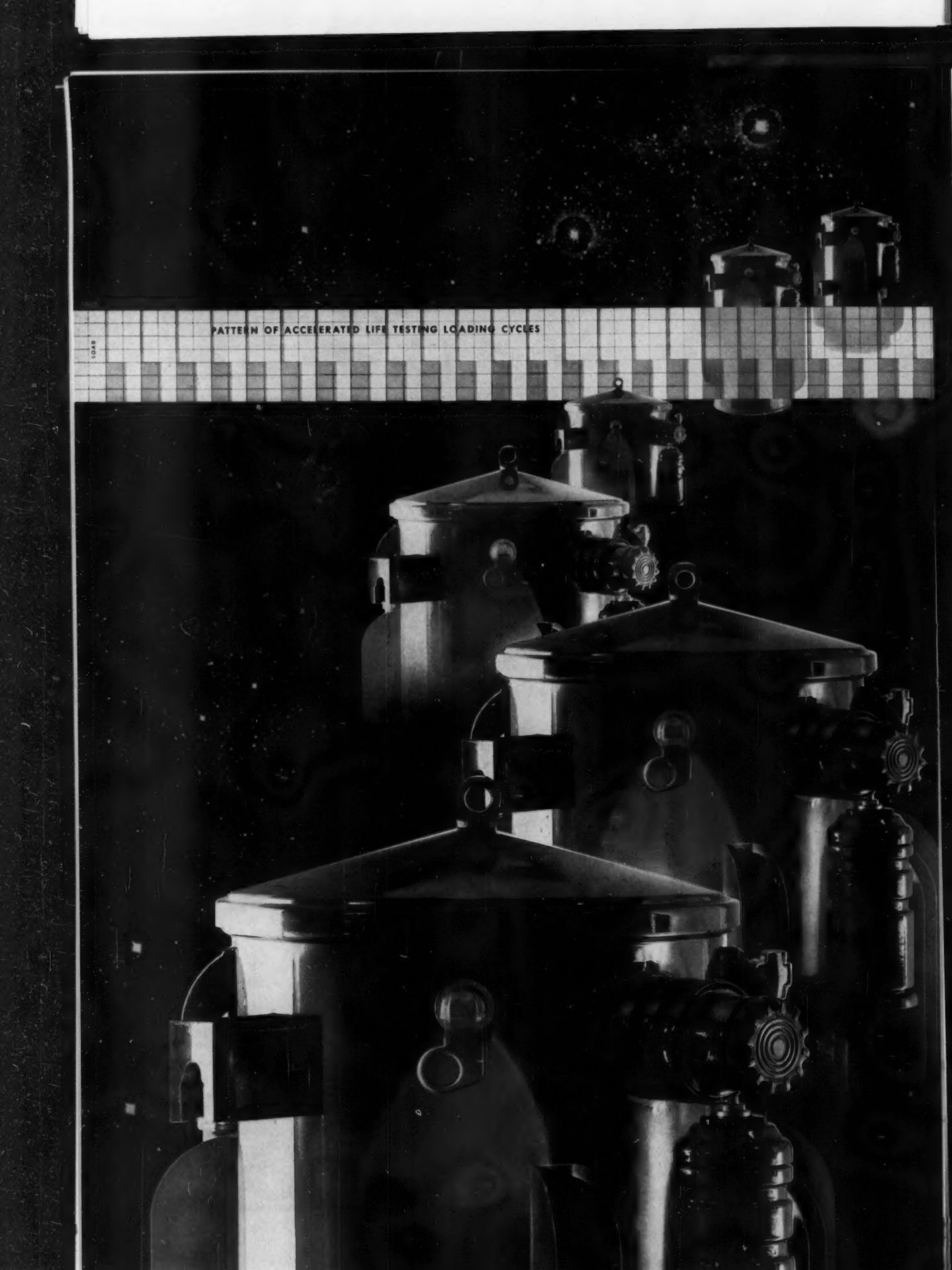


Mobile trailer units being used during line relocation resulting from new highway construction.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

LA GRANGE, ILLINOIS

Sales Offices in Chicago, New York, St. Louis, San Francisco


PATTERN OF ACCELERATED LIFE TESTING LOADING CYCLES

Helping the industry meet its growing loads

Transformer life-testing today . . . a new "known" to help you plan 1987 equipment investment

Increasing loads, changing load patterns dominate the industry's equipment planning today. These same factors are forcing transformer investment programing further into the future, further into the unknown of ultimate transformer performance.

Throwing new light onto such problems as load capability, equipment aging, transformer retirement is a unique new Westinghouse concept—accelerated life-testing of distribution transformers. Life-testing means transformers are subjected to a series of tests representative of actual service conditions—30 years of normal equipment life are packed into three. Range of tests and duty cycles used provide a complete thermal, electrical and mechanical life-performance check on completely assembled, standard transformers.

Now, and for the first time, the effect of design changes on the life expectancy of a transformer is predictable. Already, accelerated life-testing offers utilities a complete prove-out on the recently announced 20% increase in overload capability of all Westinghouse distribution transformers.

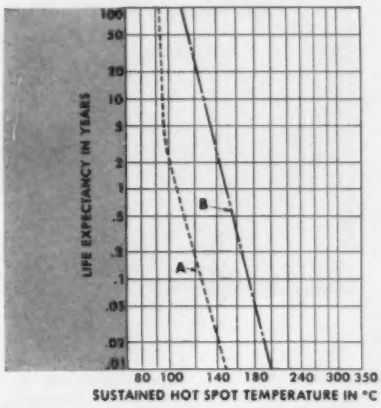
The evidence being gained from functional life-testing permits more accurate forecasts of the service life expectancy of transformers under a wide range of conditions. It will help you load transformers closer to optimum. Permit planned change-out schedules. Enable you to utilize equipment more fully. In short, here is a new and singular management tool to help utilities mate products to modern load demands. J-97199

YOU CAN BE SURE...IF IT'S

Westinghouse

Pretesting Transformer Life . . .

Functional life-testing is a new and realistic technique for establishing life-expectancy standards for transformers. Pioneered by Westinghouse and developed by A. M. Lockie, design engineer, this accelerated life-testing is programed in two ways—testing to the point where transformers are no longer fit for service, and testing to destruction. Procedures are based on experience obtained from putting transformers through 2,200 overloads, 30 short circuits at 15 times rated current, a series of impulse, dielectric and induced potential tests, and daily load cycles up to 450% of rating. For full description, see Lockie's AIEE papers, "Functional Life-Expectancy Tests for Liquid-Filled Transformers" (55-520 and 53-243).



Data obtained from functional life-tests now shed new light on transformer life expectancy, and show the practicality of heavier loading. Curve "A" is the life-expectancy curve derived from the ASA guide for loading transformers—the generally accepted guide before the development of functional testing. Curve "B" was published by Westinghouse in 1953 as the result of early functional tests which helped to determine circuit breaker settings used then. Tests conducted since 1953 show that, for Westinghouse distribution transformers, even curve "B" is conservative, and have led to the pioneering of higher breaker settings. Here is a new "known" to help you plan 1987 equipment investment.

Call your Westinghouse representative for more information.

What's new from REYNOLDS ALUMINUM

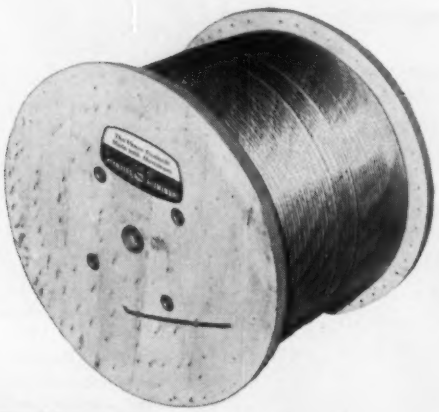
(there's always something new)

in products, facilities and services

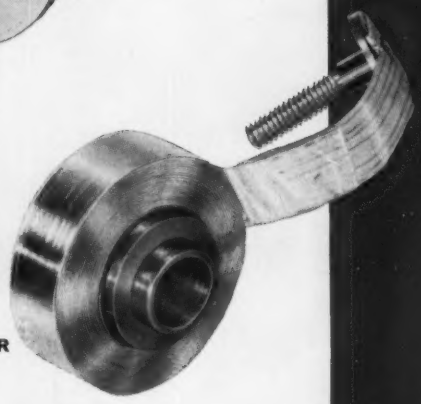
Electrical products developments . . . ever-expanding plants . . . the most modern equipment and production techniques . . . competent engineering and research service—all devoted to progress in the electrical industry.

Reynolds is constantly advancing with the electrical industry. Reynolds helps meet present industry requirements, anticipates future needs, and often leads the way to greater efficiency and greater economy . . . with aluminum. That's why there's always something new for the electrical industry . . . from Reynolds Aluminum.

On these pages you'll see examples of "What's New from Reynolds Aluminum". For more information about Reynolds electrical products, facilities and services, contact your nearest Reynolds office, your nearest Reynolds Electrical Distributor, or write *Reynolds Metals Company, P.O. Box 1800-EL, Louisville 1, Kentucky.*



NON-RETURNABLE REELS Reynolds new no-deposit, non-returnable wooden reels hold bare conductors up through 4/0ACSR. They withstand shipment anywhere, rough handling and stringing operations. They save you time and money: no reel deposit; no empty reel gathering; no reel storage; no reel inventory; no reel return shipments; no reel repair charges.

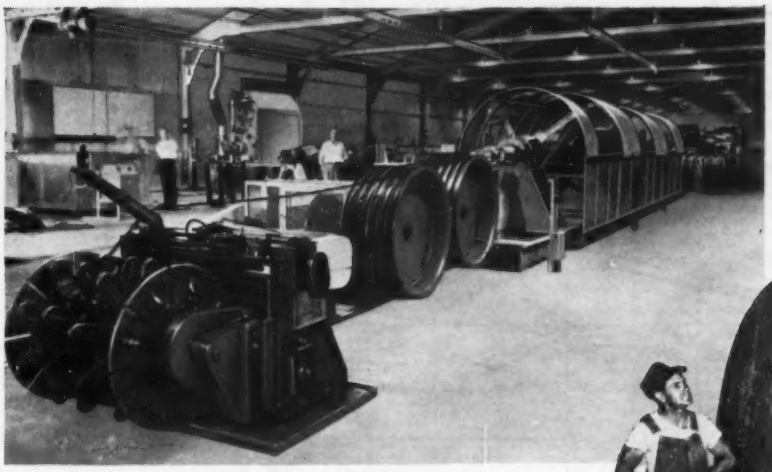


INTERLEAVED STRIP CONDUCTOR WOUND ON MAGNETIC COIL

10KVA DRY-TYPE TRANSFORMER WITH ANODIZED STRIP

ALUMINUM STRIP CONDUCTORS ANODIZED OR INTERLEAVED

In electromagnetic design both types offer advantages of increased electrical performance, lower costs, better availability. Reynolds Anodized Strip Conductor is recommended for application in the heavier gauges where high temperature operation is important. Reynolds Interleaved Conductor utilizes the lighter gauges at more conventional operating conditions.



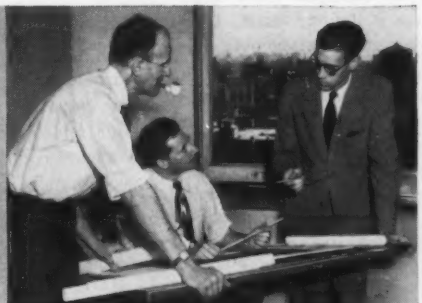
NEW 84" DIAMETER REEL. Big reel for a big job. Carries almost 10,000 pounds or approximately 4,600 feet of Reynolds ACSR cable—size 1,780,000 CM—Stranding 84 Al./19 St.

NEW CABLE FACILITIES

Reynolds newly expanded Sheffield, Alabama wire and cable mill has 174,000 square feet of floor space devoted exclusively to the production of rubber and plastic covered weather-proof conductor and cabled secondary service drop.

REYNOLDS RESEARCH FOR BETTER TECHNIQUES, PRODUCTS

Reynolds expanded metallurgical research laboratories in Richmond, Virginia, provide testing grounds for the latest developments in aluminum for the electrical industry.



REYNOLDS ENGINEERING SERVICE

For in-the-office or in-the-field help on your electrical problem, you can count on Reynolds Engineers. These men offer a wealth of experience to complement your own knowledge in the electrical field.

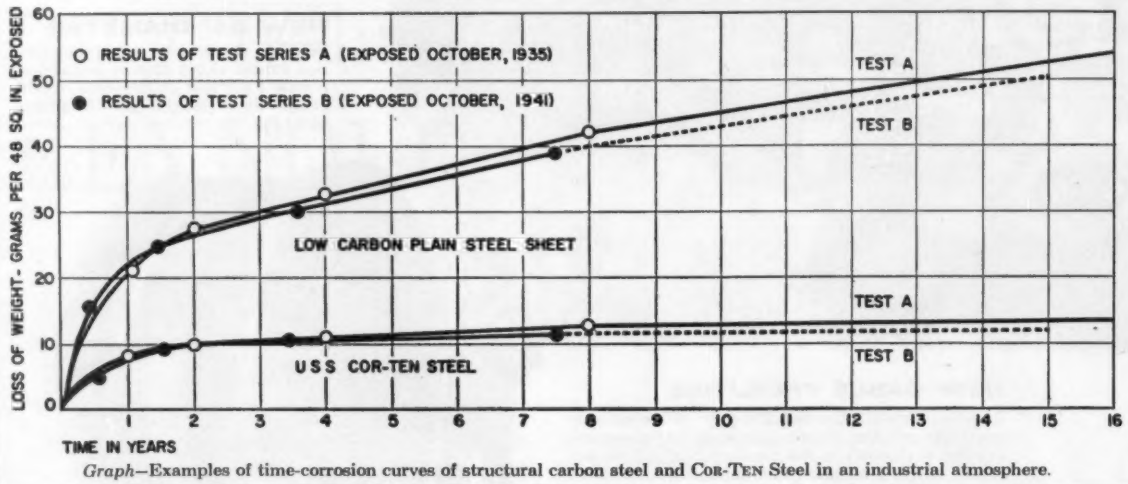
See "Circus Boy", Reynolds exciting dramatic series, Sundays on NBC-TV

NATIONAL ELECTRICAL Week
FEB. 10-16, 1957

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

ADVERTISEMENT

This chart shows time-corrosion curves of two separate tests. During the last 8 years of test A, begun in 1935, the carbon steel corroded at least 8 times more than the COR-TEN Steel. Note that test B, begun in 1941 at the same industrial location, follows almost the exact curve of the earlier test. Other test data warrant extrapolation of test B to 16 years based on the straight line corrosion typical of COR-TEN Steel.



Graph—Examples of time-corrosion curves of structural carbon steel and COR-TEN Steel in an industrial atmosphere.

How Atmospheric Corrosion-Resistant USS COR-TEN Steel Cuts Replacement Cost of Pole Line Hardware

• COR-TEN Steel's Atmospheric Corrosion Resistance is 4 to 6 times that of carbon steel.

• Anticipated Life of COR-TEN Steel Pole Line Hardware is equal to life of a treated pole.

To understand why and how USS COR-TEN Steel cuts pole line hardware replacement costs, you need only consider why pole line hardware needs replacement at all. Conventional hardware made of galvanized carbon steel has adequate strength to begin with. However, when the protective coating is gone, the base metal beneath is exposed to the elements. Gradually, through the ravages of atmospheric corrosion, the hardware literally *loses weight*—and therefore *strength*—to the point of physical failure. How long it will retain sufficient strength to do its job safely depends, of course, upon the atmospheric conditions in the locality. Deterioration will normally be more rapid in a marine or industrial atmosphere than in a rural area. All too often, hardware must be replaced while the treated pole supporting it is still good for many more years of service.

The answer to this problem is obvious—find an *economical* material that has greater resistance to corrosion. That material is available in USS COR-TEN High-Strength Low-Alloy Steel. Not only does it have greater strength than carbon steel, but because of its superior resistance to atmospheric corrosion, COR-TEN Steel Pole Line Hardware should last as long as the treated pole that supports it.

Atmospheric Corrosion Resistance

While its greater strength—50% high yield point—is a definite asset, USS COR-TEN's greatest advantage over carbon steel in hardware applications is its superior resistance to atmospheric corrosion—4 to 6 times that of carbon steel. The reason? Simply this: when first subjected to the elements, COR-TEN Steel forms a smooth, *tightly adhering* coat of oxide scale. This coating, unlike that on carbon steel, clings so tightly to the metal that it tends to shut out the elements, acting as a barrier against progressive attack on the steel beneath and effectively slowing down further corrosion.

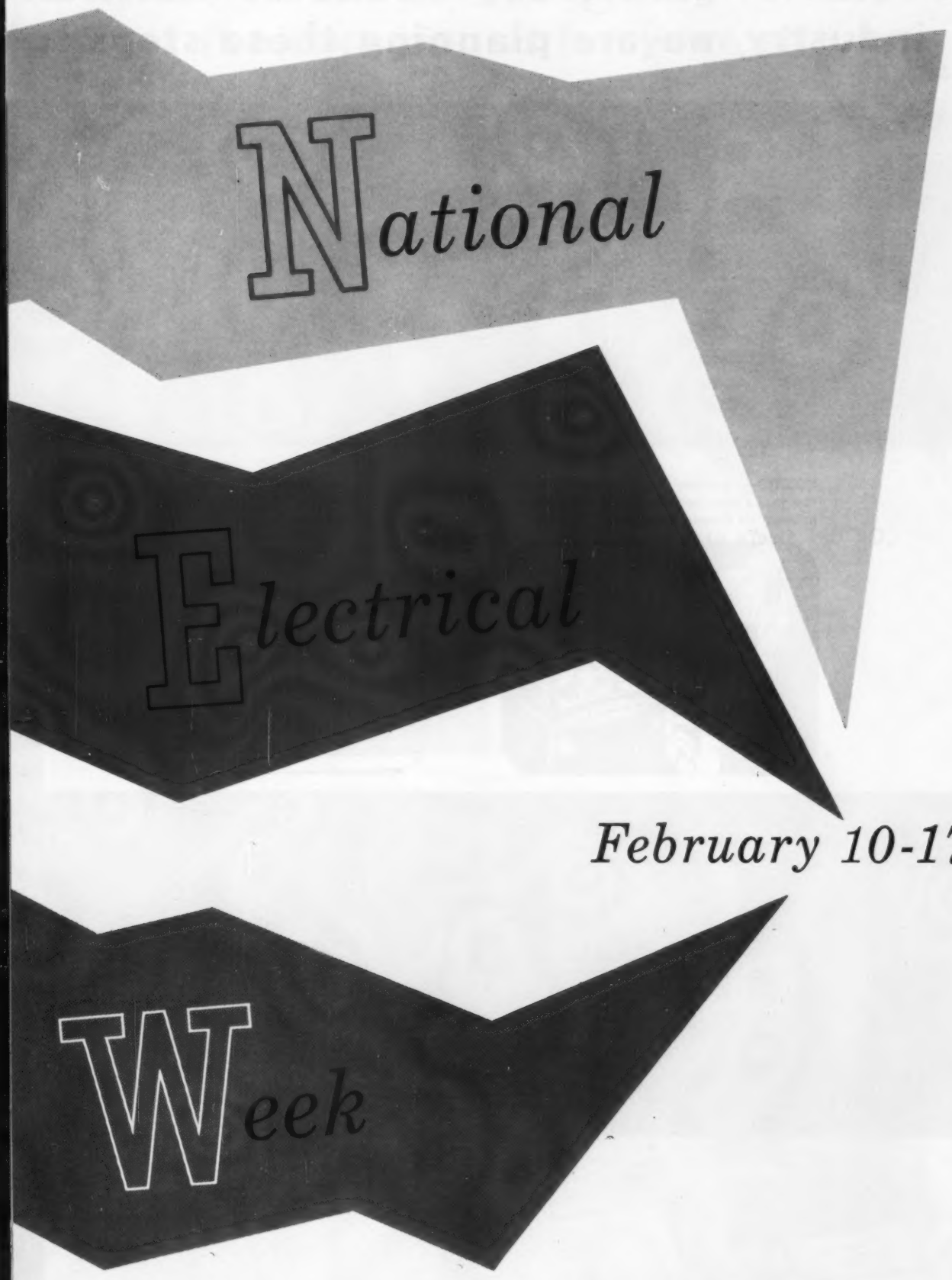
A New Practice

Hardware made with COR-TEN Steel is a relatively new idea. Frankly, it will be several years before the convictions of the first users of COR-TEN Steel hardware will be borne out. However, USS COR-TEN Steel in dozens of other applications time and again has proved its far superior resistance to atmospheric corrosion. COR-TEN Steel railway hopper cars, in addition to constant exposure—as in the case of pole line hardware—are subjected to the pounding and abrasion of millions of tons of coal and coke. Under these conditions, far more severe than pole line hardware has to face, COR-TEN Steel cars are still in service after more than twenty years of continuous use.

That is why we firmly believe that with USS COR-TEN High-Strength Steel, you will be able to install hardware on a new, pressure-creosoted pole and erase the entire installation from your maintenance budget for as long as the pole is in service. The savings on such superior service we leave to your own slide rule.

Although United States Steel is not a manufacturer of pole line hardware, we produce USS COR-TEN *for* hardware. If you would like the names of companies making hardware with USS COR-TEN Steel, or if you would like additional information on corrosion-resistant hardware, we will gladly send our book, *"USS COR-TEN Steel Pole Line Hardware."* Just write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

A Report on what Westinghouse is doing to support



Because Westinghouse believes National industry, we are planning these steps to

1

ALL COMMERCIAL TIME ON STUDIO ONE, Monday, February 11, 10:00 P.M. EST will be devoted to National Electrical Week.

AUDIENCE 20,000,000

FIRST—A National Electric Week message by Mr. Mark Cresap, Executive Vice President of Westinghouse Electric Corporation.

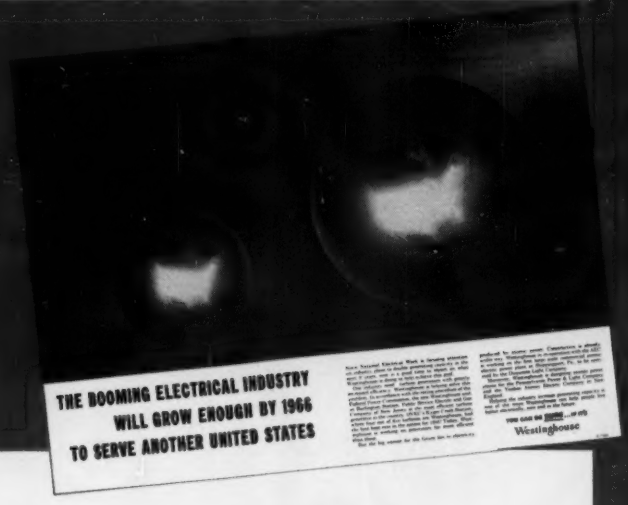
SECOND—A glimpse into the home of tomorrow that shows how electricity will make the housewife's dreams come true.

THIRD—A Live Better Electrically reminder about Housepower that shows how today's living can be fabulous too.

2

A SPECTACULAR WESTINGHOUSE SPREAD like this on the future of the electrical industry will appear in TIME Magazine February 11.

AUDIENCE 2,100,000

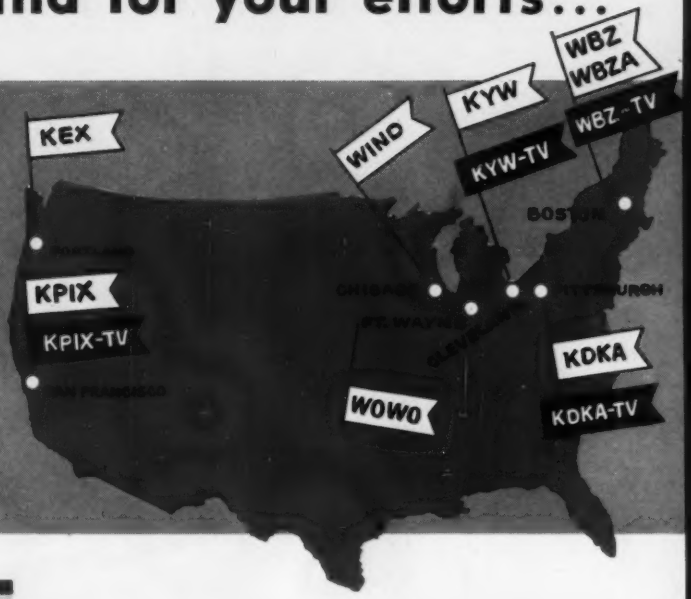


Electrical Week is a good thing for the help set the background for your efforts...

3

ALL 9 WESTINGHOUSE BROADCASTING COMPANY'S TV AND RADIO STATIONS will do a saturation job of TV and radio spots on National Electrical Week.

AUDIENCE 36,000,000



4

WESTINGHOUSE PLANTS will have "open house" and Westinghouse executives will give talks in many communities.

5

SPECIAL EDITIONS of Westinghouse News and Westinghouse Sales Record will be devoted to National Electrical Week.

6 **RETAILING DAILY** will carry a full page salute to National Electrical Week by the Westinghouse consumer products division. Westinghouse dealer ads will carry the National Electrical Week symbol.

7 **PLANS AND PROMOTION MATERIAL** for National Electrical Week have been sent to all Westinghouse distributors.

In towns and cities across the country the story of the electrical industry will be brought home to Americans.

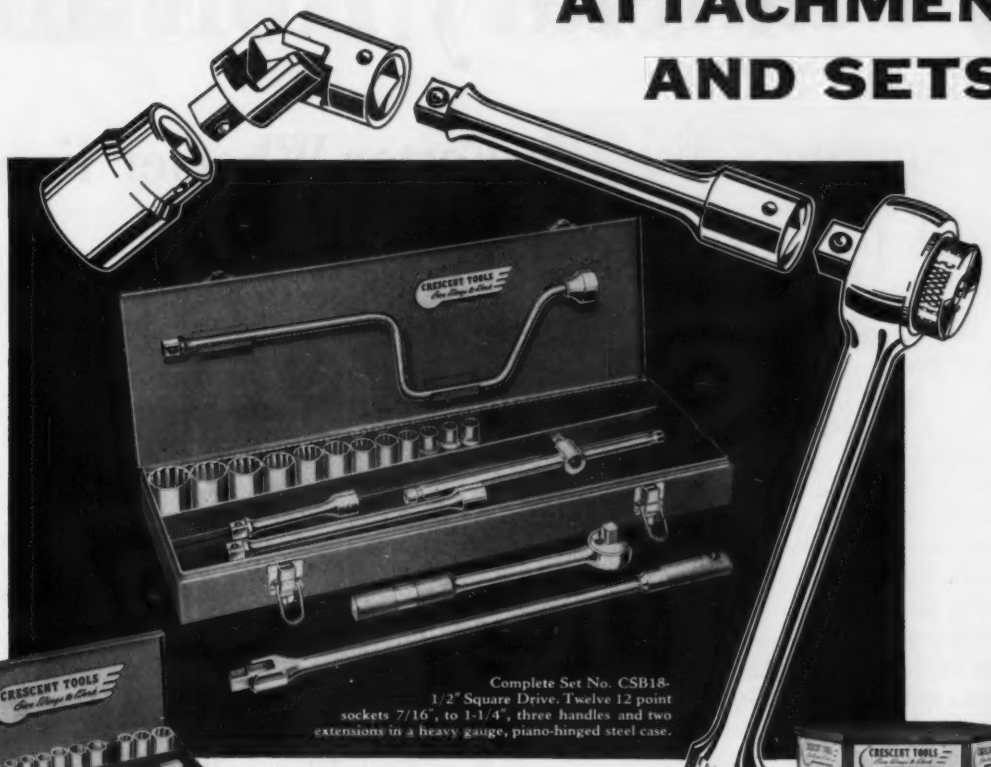
Every segment of the industry can benefit from participation in the program. As a result of these efforts, the entire industry will benefit.

WESTINGHOUSE ELECTRIC CORPORATION

YOU CAN BE SURE - IF IT

Westinghouse

CRESCENT SOCKET WRENCHES, ATTACHMENTS AND SETS



Complete Set No. CSB18-
1/2" Square Drive. Twelve 12 point
sockets 7/16", to 1-1/4", three handles and two
extensions in a heavy gauge, piano-hinged steel case.

"Midget" Set No. CMB16. 1/4" Square Drive. Eight 6 point and three 8 point sockets 3/16" to 7/16", two handles and cross bar and two extensions in a sturdy metal case with piano-hinged cover.

Here's world-famous Crescent Quality in a moderately priced line of Socket Wrenches. All popular sizes. Thirteen set combinations: 1/4", 3/8", 1/2" and 3/4" square drives; 6, 8 and 12 point sockets; standard and deep types, and a variety of handles, drives and attachments. Precision machined from alloy steel, permitting thinner than average side walls with no sacrifice of strength. Chrome-plated . . . loaded with utility features.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

Planetary Roll and

complements the Foster Wheeler line of pulverized fuel systems

THE FOSTER WHEELER Type MB planetary roll and table pulverizer, developed in Germany, is a constant-speed mill which has proved to be exceptionally efficient and economical to operate and maintain.

In the MB pulverizer, grinding action takes place between a slowly rotating horizontal table and three spheroidal rollers, uniformly spaced around the axis of the table and subjected to controlled thrust pressure by a large number of coil springs. The motion of the table causes the rollers to rotate while circling planet-fashion and rolling over the material on the grinding ring.

Air or gas, entering from below the pulverizer table, floats the ground particles up into the classifier, located in the top of the housing. Particles too coarse to float fall back onto the table for further pulverization. All routine adjustments to the spring tension gear or classifier vanes can be made externally while the mill is in operation.

Wide experience abroad indicates that this new addition to the complete line of heavy-duty FW pulverizers offers the following advantages.

1. ***Low Power Consumption***
   Assures exceptional economy of operation, year after year.

2. ***Low Maintenance***
   Extremely rugged construction and accessibility of wearing parts reduces down-time for servicing.

3. ***Uniform Product Fineness***
   Pulverizer and classifier design assures extreme uniformity of particle size.

4. ***Pressurized or Suction Operation***
   Provides complete flexibility for various types of service.

5. ***All Necessary Adjustments Made Externally with Mill Operating***
   Avoids shut-downs for changes in pulverizer pressure or classifier adjustment.

6. ***Simple Renewal and Replacement of Grinding Rolls and Table***
   Cuts down-time for infrequent replacement of wearing parts.

THE TYPE MB PULVERIZER, with Foster Wheeler feeders, distributors, burners and fans or exhausters, provides an exceptionally efficient and economical pulverized fuel system.

For complete information on the new PLANETARY ROLL & TABLE PULVERIZER, write for Bulletin MB-55-5.

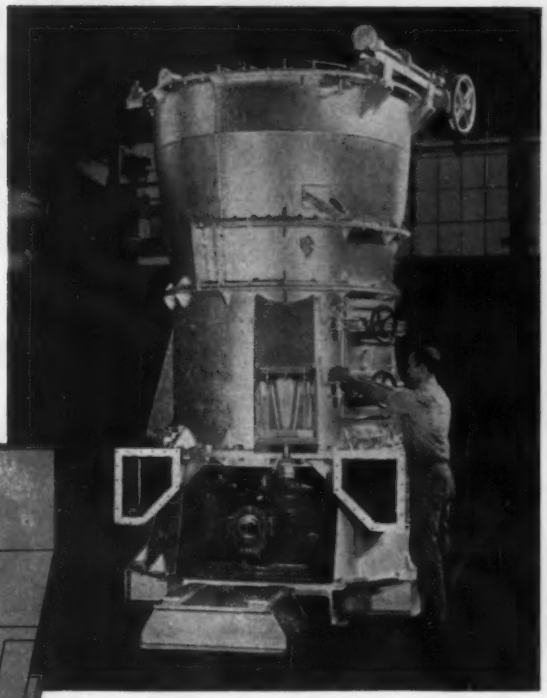
For full details on Foster Wheeler heavy-duty BALL MILL pulverized fuel systems, write for Bulletin BP-53-3.

Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.

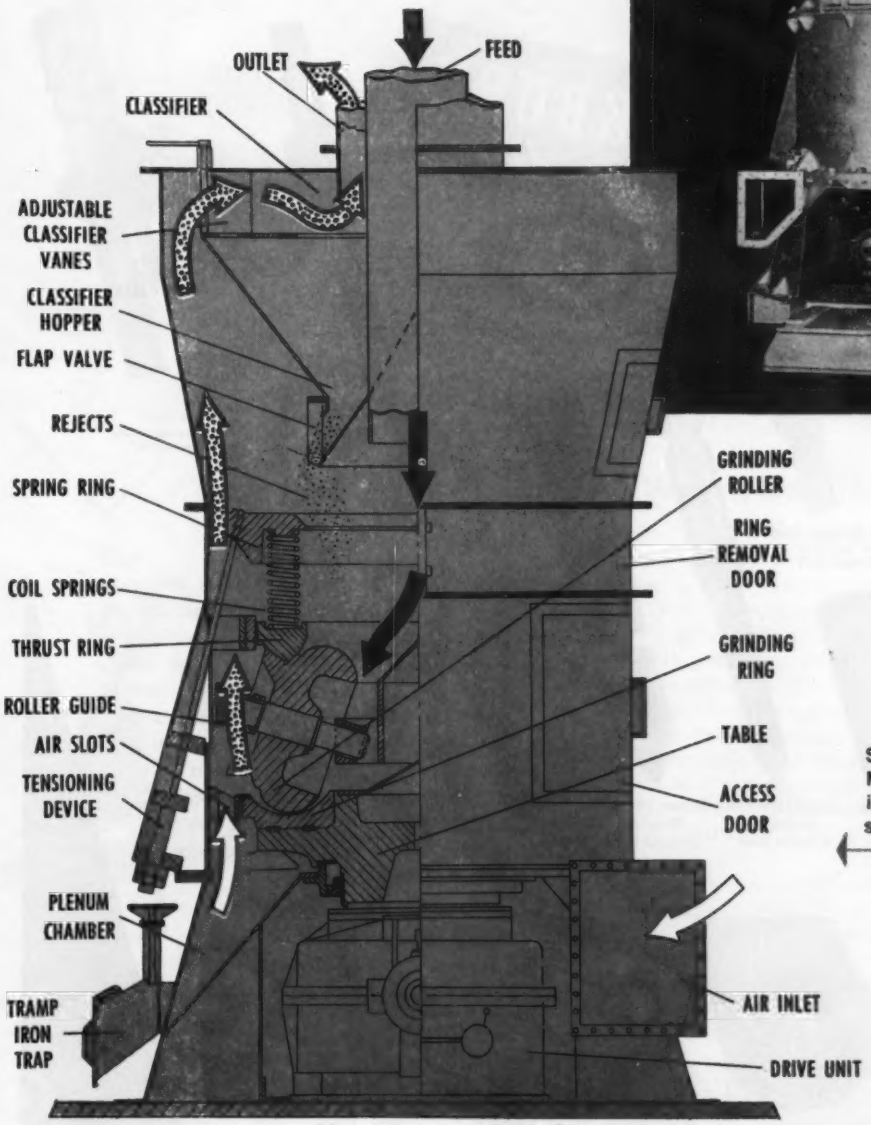
FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

Table Pulverizer



Exterior view of completely assembled Foster Wheeler Type MB planetary roll and table pulverizer.



Sectional drawing of Type MB pulverizer with parts identified to show construction and operation.

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Steel Driving Stud
for Sectional Ground Rods

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling
for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

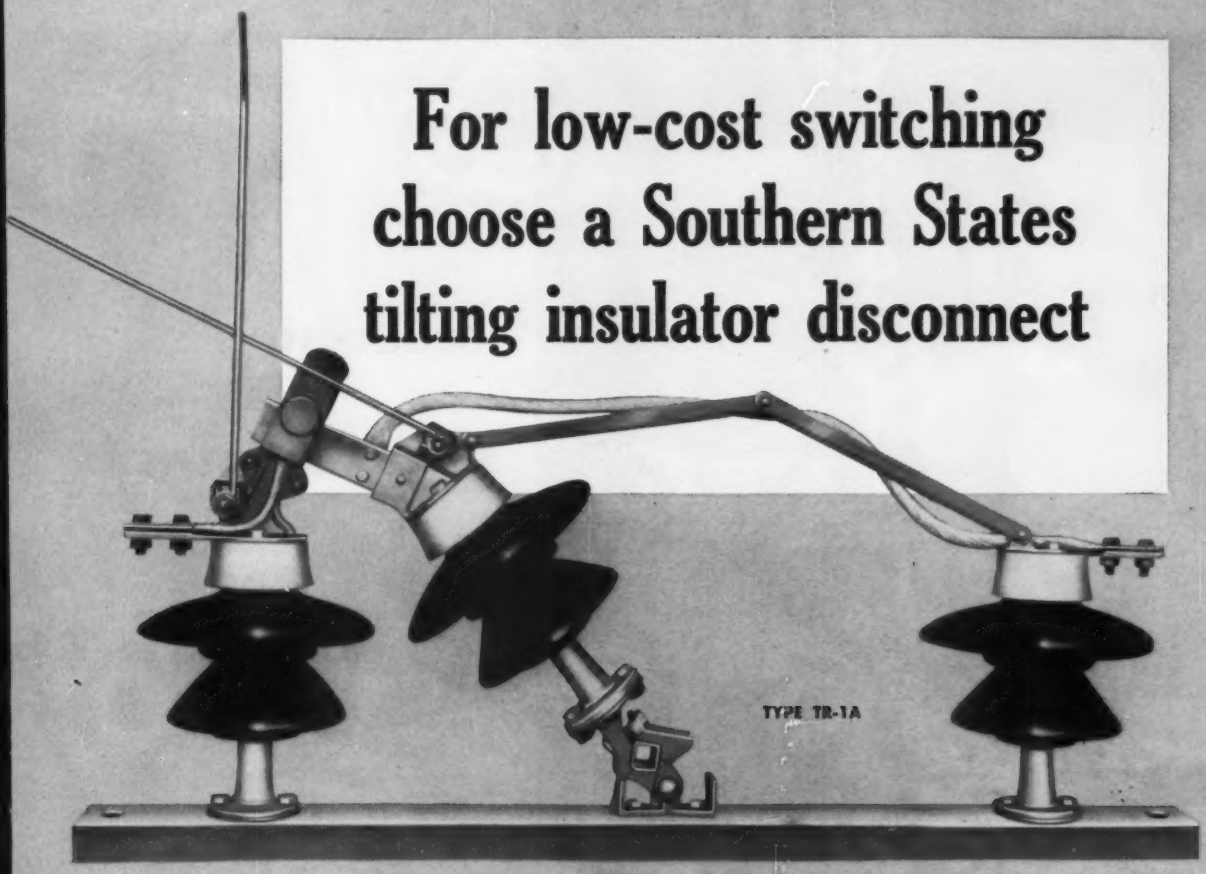
Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

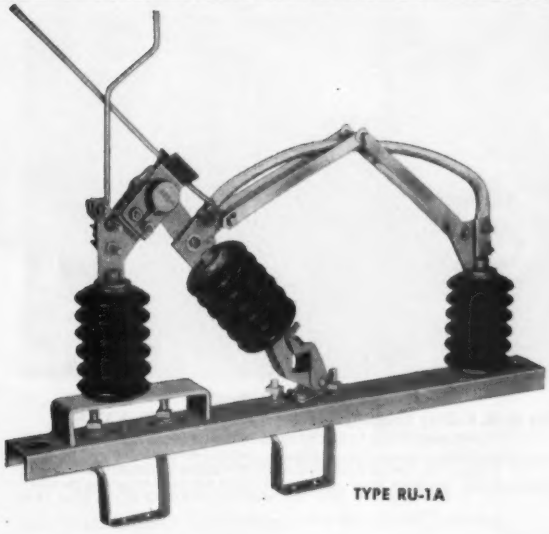
Available Through Electrical Wholesalers Everywhere

DISTRIBUTED ON THE WEST COAST BY
KORTICK MFG. CO.

JASPER BLACKBURN CORPORATION
ST. LOUIS 6, MO.
35 Madison Street — Phone MAin 1-2821

For low-cost switching choose a Southern States tilting insulator disconnect





TWO COMPLETE LINES

When easy, low-cost installation is the first requirement for disconnecting switches, Southern States offers you not one —but two complete lines from which to choose.

The Type TR-1A is a high-quality rocker-type disconnect that meets NEMA Standards in every respect. It is available in voltage ratings from 7.5 kv through 69 kv and continuous current ratings of 200, 400, and 600 amps.

The Type RU-1A is a distribution level tilting insulator switch specifically designed for pole-top mounting. Its dielectric strength is the same as standard levels for other distribution equipment, but it is below NEMA Standards for power switching equipment. It is available in voltage ratings of 7.5 and 15 kv and continuous current ratings of 200 and 400 amps.

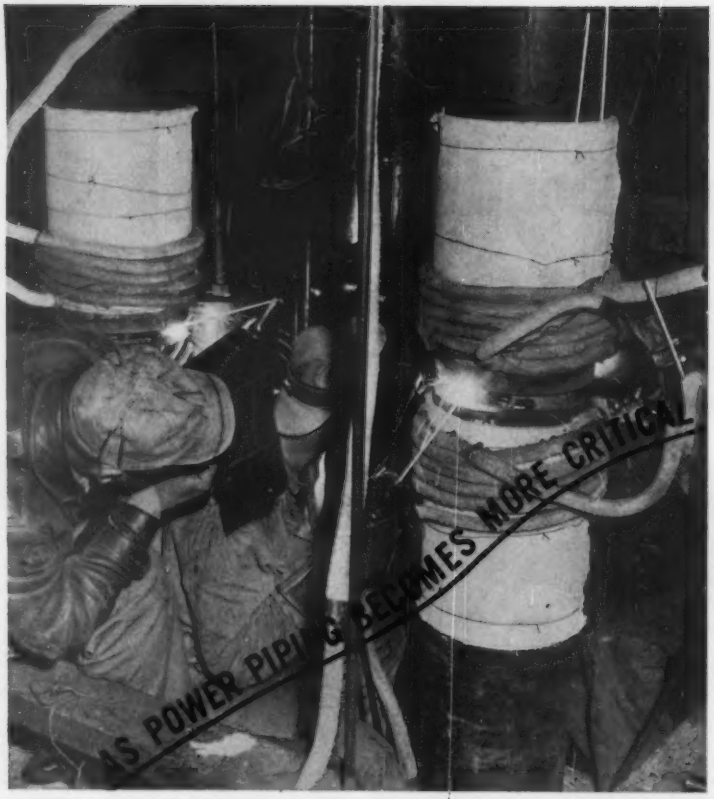
Both types are ruggedly constructed, and will provide reliable switching under all service conditions. Many utilities throughout the nation have found in these switches the answer to their needs for low-cost, easily installed disconnecting switches. So can you. Get full details in our Bulletins 54 RU and 3050.

EASY INSTALLATION

One reason utilities find the installation of these switches so easy is the method for affixing the interphase shaft to the rocking insulator. The shaft is laid in its proper position across all three phases and then only one bolt per phase is tightened to complete the installation, saving valuable installation time in the field.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



KELLOGG'S FIELD CONTROL KEEPS PACE

All high and low pressure steam piping for the 225,000-kw turbine-generator at Appalachian Electric Power Company's Glen Lyn, Virginia, station was fabricated and erected by M. W. Kellogg—using local union labor. Initial steam conditions are 1050 F, 2000 psi, with reheat at 1050 F. Main steam lines are 2¼% chrome-1% molybdenum, 12¾ in. OD, 2¼ in. average wall thickness. To meet the exacting requirements of both American Gas and Electric Service Corporation and The M. W. Kellogg Company, close control of techniques and procedures was doubly important.

At Glen Lyn, as elsewhere in the field, M. W. Kellogg's reputation for completing a power piping project efficiently and promptly is due to the right techniques, the right materials, the right equipment, and—equally important—the right men to train and supervise labor to Kellogg's special standards. We welcome the opportunity to demonstrate these unique abilities and facilities. Some of them, including K-Weld*, are described in our 12-page booklet, "For The Modern Central Power Station." Write for your copy.

(Above) An inspector on Kellogg's permanent staff supervises welding of main steam lines at the Glen Lyn Station. (Below) Controls for the gang of 40-kva stress relieving units at Glen Lyn provide a permanent record of preheating, concurrent heating, and stress relieving cycles, ranging from room temperature to 1350 F.

Fabricated Products Division
The M. W. Kellogg Company, 711 Third Avenue, New York 17, N. Y.
A SUBSIDIARY OF PULLMAN INCORPORATED
The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London
Kellogg Pan American Corp., New York • Societe Kellogg, Paris
Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

**Trademark of and patented by The M. W. Kellogg Company*

Silent...and completely filled

General Electric capacitors don't gurgle because they are filled to the very tops of the bushings. Tip one and listen; test one with a stethoscope; or just tap it with a coin. You can double-check by looking into the glass bushings.

Why such tests? Because air bubbles in a capacitor can do more than gurgle. They can cause internal flash-over and failure. Even if the unit is mounted upright, you can't be sure a bubble hasn't been trapped in the winding to cause subsequent trouble.

No air gets in G-E capacitors because, after each unit is completely filled with Pyranol* under a vacuum pressure, the fill-hole is sealed under Pyranol. Result: no voids, no air channels, no weak spots where failure can start.

This is another of the Engineered Extras you get with G-E capacitors. Ask your General Electric Apparatus Sales Engineer to tell you more. Or write to General Electric, Section 445-5, Schenectady 5, New York.

*Reg. Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Add 10 KVA...use same mounting

Tough Formex* wire, now in all ratings, makes General Electric pole-type distribution transformers up to 10% smaller . . . simplifying "changeouts" to next higher rating.

"Changing out" transformers—that is, substituting a higher-rated unit for the old lower rating already on the pole—can be a time-consuming job. What really makes it tough is having to change pole hardware and set bigger poles for the higher rated units.

But today such installation headaches can be largely a thing of the past. For General Electric has now completed the introduction of a whole new line of pole-type transformers with smaller tank sizes.

*Reg. Trademark of General Electric Co.

Use of Formex wire cuts tank sizes

Using Formex wire instead of wire covered with bulky cotton-and-paper insulation, G-E engineers have appreciably slimmed down tank sizes. In most cases, a higher-rated unit now fits the same mounting hardware and same pole as the lower-rated unit already in place.

Take the new G-E 25-kva conventional transformer. It used to be 38 inches tall. Now it's only 34; so it fits in the same spot as a 15-kva unit hung five years ago. The new 25-kva transformer also features a mounting bracket with bolt holes drilled to match the mounting holes for 15-kva units. So there's no longer any need to drill new holes in the pole in order to substitute a 25-kva unit for a 15-kva unit.

No overnight development

The new units are no overnight development. They are the result of continual research and experimentation. General Electric first used Formex wire for high-voltage coils. Gradually Formex wire was used on low-voltage coils in a limited number of ratings. And today's new designs are the culmination of this work.

Formex Wire Gives Extra Dependability

Formex wire sets new standards for electrical and mechanical strength. The impulse strength of Formex wire, for example, is phenomenal; three mils thickness of the film insulation has *twice* the impulse strength of six mils of ordinary paper and cotton. Formex is so rugged it will withstand twisting, scraping, burning and hammering that would demolish ordinary insulation.

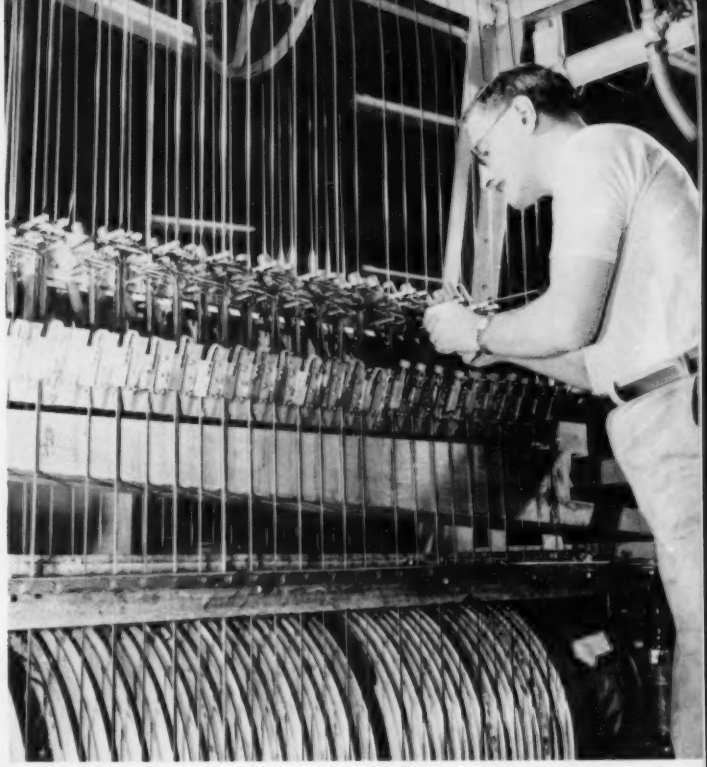
The changeover to Formex is complete for all ratings through 167 kva.

All Transformers Are Not Alike

Formex wire is only one advantage of General Electric distribution transformers. Others include *impulse testing* to assure extra-long life, *one-piece clamping bands* to give superior sealing and simplify servicing, AL/CU *terminals* to assure tight connections with either copper or aluminum conductors, and many others—evidence that all transformers are *not* alike.

LIVE BETTER ELECTRICALLY

Prove to yourself how tough Formex wire is. For a sample that you can test, write to Section 431-48, General Electric Company, Schenectady 5, N. Y.

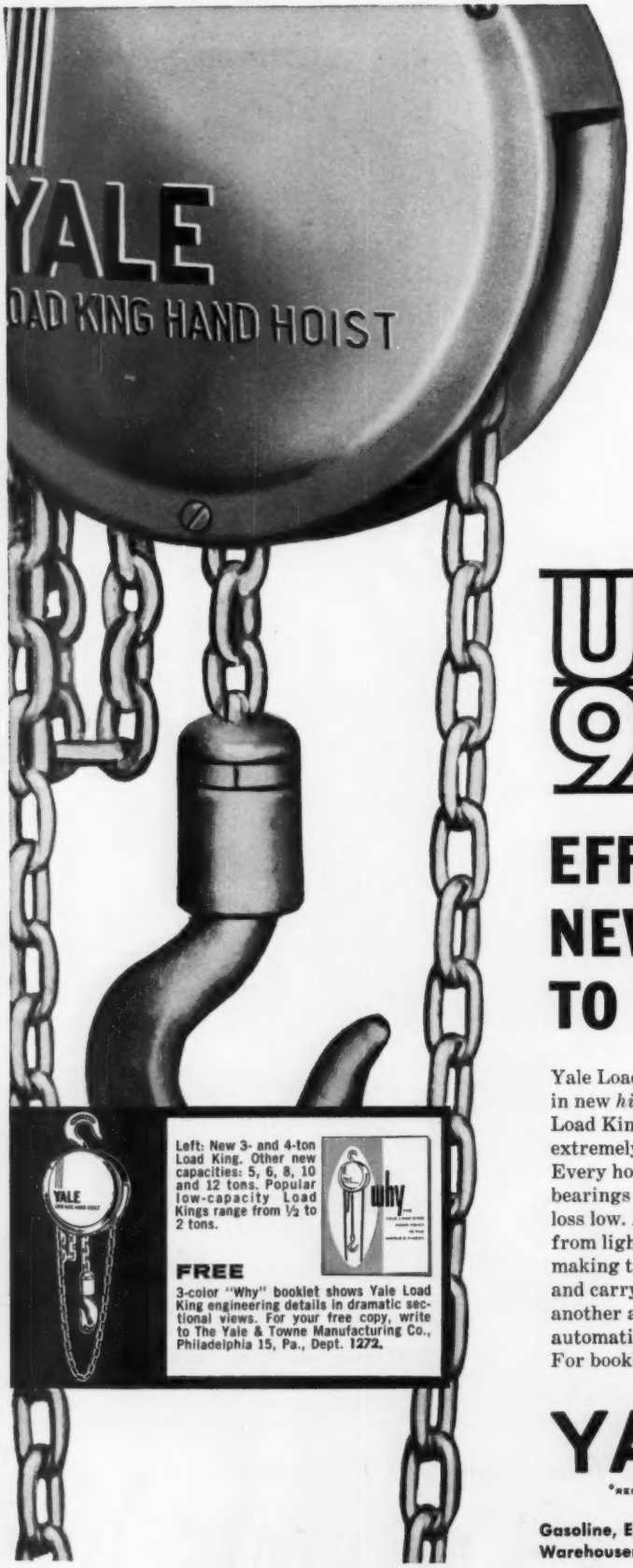


UP TO EIGHT COATS of enamel are applied to the Formex wire, and each coat is baked. Mechanically rugged, Formex wire has great electrical strength. Just 3 mils thickness of film has twice the impulse strength of 6 mils of paper-and-cotton insulation.

COMPACT FORMEX WIRE COILS together with improved core steel, make possible reductions of up to 10 per cent in transformer size and weight . . . yet Formex wire coils have great short-circuit strength. The result, transformers are lighter, easier to handle.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Left: New 3- and 4-ton Load King. Other new capacities: 5, 6, 8, 10 and 12 tons. Popular low-capacity Load Kings range from ½ to 2 tons.

FREE

3-color "Why" booklet shows Yale Load King engineering details in dramatic sectional views. For your free copy, write to The Yale & Towne Manufacturing Co., Philadelphia 15, Pa., Dept. 1272.

UP TO 95%

EFFICIENCY! NEW CAPACITIES TO 12 TONS!

Yale Load King Hand Hoists are now available in new *high* capacities—completing the line of Load Kings famous throughout industry for extremely high mechanical efficiencies. Every hoist in this extended line has ball bearings on all rotating shafts to keep friction loss low. All parts are precision-tooled from light, high-strength alloy metals, making these hoists speedy, rugged, easy to use and carry. The Synchromatic Load Brake, another achievement of Yale research, applies instant, automatic, safe-hold brake action between pulls. For booklet of full facts, see box at left.

YALE* **INDUSTRIAL LIFT TRUCKS AND HOISTS**

*REG. U. S. PAT. OFF.

Gasoline, Electric & LP-Gas Industrial Lift Trucks • Worksavers Warehousers • Hand Trucks • Hand and Electric Hoists

EDITORIALS

The Social Aspects of Science

A subcommittee of the American Association for the Advancement of Science has found "That there is an impending crisis in the relationships between science and American society. This crisis is being generated by a basic disparity. At a time when decisive economic, political, and social processes have become profoundly dependent upon science, the discipline has failed to attain its appropriate place in the management of public affairs."

This profound statement, along with supporting material, was developed by the Interim Committee on the Social Aspects of Science of the AAAS.

Other significant comments are typified by, "The efforts to explain the nature of science to the public is slight compared with the public attention now given to less consequential areas of human activity" and "While this advance of science has greatly improved the condition of human life, it has also generated new hazards of unprecedented magnitude. These include: the dangers to life from widely disseminated radiation, the burden of man-made chemicals, fumes and smogs of unknown biological effect which we now absorb, large-scale deterioration of our natural resources, and the potential of totally destructive war."

Thus has the committee outlined some important areas in the scientific field where the relation between science and society in general is very close indeed.

The challenge of this report is not limited to scientists alone, it is of equal significance to the engineering profession. In fact it covers areas where the engineer is involved to a much greater extent than the pure scientists. In fact the engineer can add other fields such as the impact of automation on our society.

The engineering groups as represented by and acting through the Engineers Joint Council should form a committee similar to that of AAAS. This would have the responsibility of seeking out areas needing study and interpretation to the public. Then the council and member societies could find ways of bringing these important matters to the attention of all who should be informed.

It is known that some thought has already been given to this idea by the Engineers Joint Council. And now since the pioneering work has been done, EJC has better guide posts to use in recognizing its own responsibility and going forward with a similar activity.

This Is A Week to Remember

This is National Electrical Week! Out of all the weeks of the year, this is the industry's own; set aside to mark the vital part that electricity plays in our lives, the key role of the electrical industry in our economy, and to honor the pioneers who built it—for this is also the week of Thomas Edison's 110th birthday.

In the second year of its observance, the National Electrical Week celebration has gathered momentum. In big and little towns across the country, all segments of the industry have extended themselves to tell Americans, at home and at work, what electricity has done to make our nation strong and our homes more pleasant. Carried out against a nation-wide backdrop of television, radio and magazine publicity, this activity at the local level has achieved an outstanding cumulative effect.

But perhaps one most significant and lasting aspect of the National Electrical Week observance is the inclusion and recognition of National Science Youth Day on February 11. This week can serve no higher purpose than to inspire and to encourage more young people to pursue industry careers in engineering; to stimulate interest in science education and to lay the groundwork that will not only relieve today's shortage of technical manpower, but provide the best guarantee of future growth and progress of the electrical industry and of the nation.

IN NEW YORK, AIEE Pres M. S. Coover listens to conversation while looking on (left to right) are M. J. Kelly and T. F. Gleichmann, Bell Labs; J. S. Jack, AT&T; and H. A. Lewis, A. N. LeBeit, and E. T. Mottram, all of Bell Labs

AIEE Hears Data on Transatlantic

- Three-way conversation links New York, Montreal, and London during concurrent sessions of the AIEE and England's Institution of Electrical Engineers

- Listening in by way of loudspeakers, delegates learn that elements in submerged repeater assemblies are gold-plated to prolong service life

Electrical engineers attending concurrent society meetings in London and in New York held an intercontinental discussion of the world's first pair of transatlantic telephone cables. And the conversation was carried over the cables themselves.

Loudspeakers were rigged so that delegates could hear what was being said. The conversation was carried

How Bad Is the Engineer Shortage for Utilities—

- Informal EW survey at AIEE shows students shy away from utility jobs. Here's what some companies are thinking—and doing—about it

The much-touted engineering manpower shortage is being felt by electric utilities, but the situation is not critical. This is the consensus of opinion gathered in an informal survey by EW editors at the winter general meeting of the American Institute of Electrical Engineers.

An eastern utility man even detects an easing of the engineer manpower shortage. His company is feeling the biggest pinch today in its research program, he said.

Almost all utility engineers said their companies had some unfilled engineering positions, but opinions varied as to the reasons why.

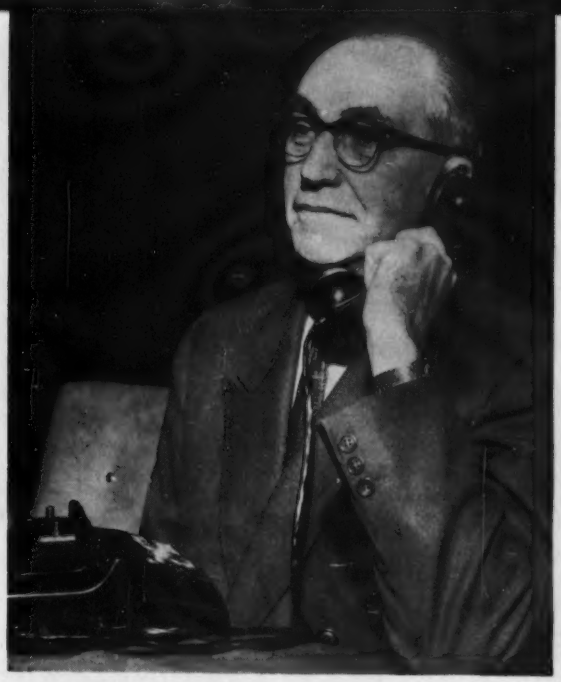
One man said there is a lack of suitable applicants at the price utilities will pay. Several others said utilities haven't been aggressive enough in selling the power industry as a place of opportunity for engineers of all types.

One executive said his company is trying to correct this situation by providing speakers to discuss the subject at local engineering schools. This utility also arranges inspection trips for students and summer jobs for local professors.

Lower Pay by Utilities Cited

All of the questioned engineers agreed, however, that their companies have been losing engineers over the past few years to competing industries. In almost every case, the reason has been better pay, they said.

One person suggested that utili-



IN MONTREAL, V. A. McKillop, president, Engineering Institute of Canada, takes part in the conversation

IN LONDON, Sir Gordon Radley, president, British Institute of Electrical Engineers, discusses cable data

Cable via Transatlantic Phone

on by M. S. Coover, president of American Institute of Electrical Engineers, and Sir Gordon Radley, president of the British Institution of Electrical Engineers.

The conversation, which included a hookup in Montreal with Verne McKillop, president of Engineering Institute of Canada, centered about the design and construction of these first two transatlantic telephone cables. Each cable is 1,950 nautical miles long, and uses 400 electron tubes and 7,000 passive components in 118 little repeater stations. Repeaters are spaced about 38 miles apart in depths exceeding 2½ miles.

It was brought out that the submerged cans and connecting wires of the repeaters are gold-plated. This technique was chosen to help guarantee that the underwater instruments would give 20 years' service before needing repair.

Tin ordinarily would have been used, but tin grows "whiskers" in the water. These whiskers can bleed off 10 ma of current, disrupting service. Gold is immune to this drawback, so gold was used instead.

and Why Does It Persist?

ties could hold engineers better by "restoring incentive in salaries for capable men"—meaning jacking up oldtimers' pay checks as the starting salaries climb for more recent engineering graduates.

Another man felt utilities are not using the full abilities of engineers they have. He cited the case of a young engineer who must do his own drafting because a qualified designer would cost the company more money.

Utility Trains Technicians

But another utility man said his company trains technicians to do some of the engineers' rote work. The company reshuffles the work load to employ engineers at fuller capacities.

A college professor, formerly chief engineer of a southwestern utility, observed that "invariably" the poorest students in his classes have gone to work for utilities. In addition to "financial opportunities," he said this might be influenced by their military service, and a failure of professors to "motivate" students to work for utilities.

He said many college graduates get experience in communications and electronics in the armed forces. Upon returning to civilian life, they capitalize upon this experience—at the expense of utilities.

Professors may gloss over opportunities awaiting students in the power industry because they, themselves, have found recognition in other fields. In seeking recognition, they conduct experiments in control engineering, electronics, and communications, using equipment in their college laboratories. They write acceptable papers based on this work. And they may be apt to stress opportunities in these fields where they, themselves, have found recognition.

1957's Power Bills: What's Their Destiny?

Hells Canyon, Niagara, federal atomic liability insurance, and other controversial measures reappear at start of 85th Congress

Most bills closely resemble their 1956 versions. How will they fare this time 'round?

The current session of Congress begins to shape up as a carbon copy of 1956 as far as legislation concerning electric companies is concerned.

A lot of familiar bills are back. The major difference is that at this early stage there are fewer bills than when Congress wound up in '56.

Back again are the big issues of last and previous years: Hells Canyon, Niagara redevelopment, TVA bond financing, Gore atomic power bill, federal atomic liability insurance, and Fryingpan-Arkansas hydro project. Notable absentees: John Day partnership and Southwestern Power Administration rate freeze.

The composition of Congress—much the same as last year—points to pretty much the same outcome for most of the legislation this year. There are some changes in sentiment, but in general the arguments will be the same.

This is the picture to date:

Hells Canyon—Sen Wayne Morse (D-Ore.) has reintroduced essentially the same bill that was defeated last year. The measure has been endorsed by 27 senators including two Republicans—Alexander Wiley (Wis.) and William Langer (N. D.).

On the House side, where joint endorsement of a bill is not permitted, five similar bills have been introduced by Reps Gracie Pfost (D-Idaho), Al Ullman (D-Ore.), Edith Green (D-Ore.), C. O. Porter (D-Ore.), and Lee Metcalf (D-Mont.).

The bill isn't considered to have any better chance of passing this year than it did last year although sponsors claim the election gave them a "mandate" to push it.

No hearings have been scheduled yet by Senate Interior Committee. It is a certainty that when they are held, the whole Snake River situation will be thoroughly aired. This will include Bureau of Reclamation's study of a High Pleasant Valley dam below Hells Canyon, and the Corps of Engineers report on the various proposals for the Middle Snake outlined by Chairman James E. Murray.

Niagara Redevelopment — The legislative picture here is still taking shape. Already in the hopper are bills similar to last summer's defeated Lehman bill. These bills, proposed by Sen J. S. Clark (D-Pa.), Rep Chas A. Buckley (D-N. Y.), and Rep Earl Chudoff (D-Pa.), call for New York Power Authority development of the project with full observance of federal preference.

Last week GOP Sens Irving Ives (N. Y.) and Jacob Javits (N. Y.) and Rep William E. Miller (N. Y.) introduced bills to reflect the joint NYPA-electric company-GOP-Congressmen compromise. Their bills call for NYPA construction but would not require preference.

Public power supporters have announced plans to oppose any such compromise. The outlook for settlement is better than in previous years, but is not a certainty.

TVA Bond Financing—No bill presenting the Administration's point of view has yet been introduced. In his budget message, President Eisenhower recommended legislation to authorize TVA to finance new construction by revenue bonds. But he stipulated that this procedure should be "subject to regular budgetary review"—that is, bonds would not be issued without first getting approval of the Administration and Congress.

Rep Robert Jones (D-Ala.) has reintroduced his bond financing bill of last year. This measure does not provide for the Congressional policing and control over TVA that the Administration favors.

The bond issue remained up in the air at the end of the last session because Congress authorized on a temporary basis the use of power revenues by TVA for expansion of existing plants. Chances are the issue will be settled this session on a compromise basis.

Fryingpan-Arkansas Project — This Administration-favored project last year was the victim of political rancor over defeat of the Hells Canyon project. Rep J. E. Chenoweth (R-Colo.) has introduced HR 594 this year and the Administration has proposed $3 million starting funds.

In the atomic energy field, two important bills were reintroduced:

Federal Power Reactor Construction—Bills by Sen Albert Gore and by Rep Chet Holifield are the same as the controversial bills defeated last summer. These would authorize $400 million for federal construction of commercial-size units.

Chances of such a bill being passed this year are dimmer than last year. Opposition from coal mining interests has solidified and so has Republican opposition on the Joint Atomic Energy Committee—a condition that did not prevail last year.

Atomic Liability Insurance—A bill providing for federal liability insurance up to $500 million for all atomic power projects was not called up for a vote last summer because the Gore bill was defeated.

For the present, this year's similar measures by Sen Clinton P. Anderson (D-N. M.) and Rep Melvin Price (D-Ill.) appear to have the same bi-partisan support with which the issue started out last year. It remains to be seen whether threats to tie the insurance question to the fate of the Gore bill materialize. But its outlook now seems good.

FLOOD DAMAGE in the shaded area is estimated above $15 million. Hazard and Pikeville were hit hard by the deluge

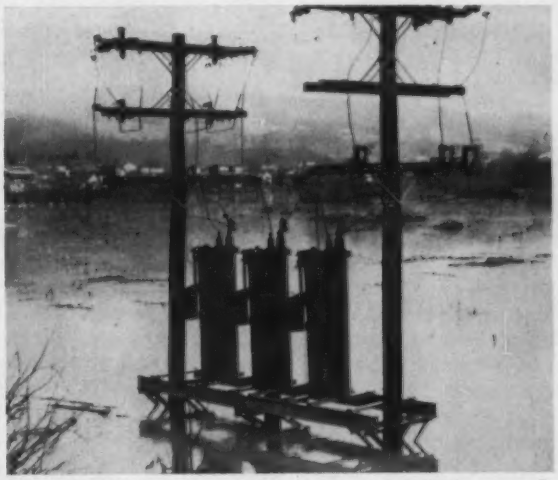
IN WILLIAMSON, W. Va., a main business street lies under water at flood crest. Many persons fled homes in valleys

Floods Wreak Havoc in Kentucky Area

Thousands of persons in the shaded area of the above map were without power recently as heavy week-long rains dumped tons of water into West Virginia, Kentucky, and Tennessee.

Appalachian Electric Power Co lost its 88-Mw steam station at Logan, W. Va., where "considerable" damage was done. No dollar estimate of the damage was available as EW went to press. But a company spokesman estimated the plant may be out for two weeks.

Hazard and Pikeville, Ky., hardest hit, were getting back to normal Feb. 1, as AEP Co crews helped crews of Kentucky Power Co repair damaged distribution systems. High-voltage transmission lines into the area were unaffected by the deluge.



IN SNEEDVILLE, Tenn., flood waters lapped dangerously near power transformers serving Hancock County residents

Ice Storm Hits AP&L's Area; Fells Poles and Wires

Arkansas Power & Light Co has experienced its worst ice storm in 20 years. Beginning Jan. 27, the company rushed 150 men into the field to restore service.

In the hard-hit northeast division, 800 miles of line —serving 13,000 customers—were knocked out. Poles were downed as well as wires. In one town, 39 snapped-off poles had to be replaced before service could be restored to one area.

In Little Rock, 7,000 persons lost electric service. In one case, the storm took its toll on the same line three times. After each repair, another tree limb would fall into the wires. After the third repair, exasperated crews conducted "emergency" tree-trimming exercises to thwart a repeat performance.

Congress Girds for Nuclear Reactor Battle

Contenders in forthcoming fight will try to decide: Should government supplement industry efforts to hold world leadership in nuclear power development?

Democrats and Republicans in Congress are set for a showdown fight on atomic power development. The issue: Should the government build atomic power reactors to supplement industry's program?

The first shots will be fired Feb. 19, when the Joint Committee on Atomic Energy begins hearings on the status of civilian atomic power development. These hearings are required by law in the first 60 days of each session of Congress.

The Democrats will try to prove that the present program is not big enough and not going fast enough to maintain world leadership. Therefore they will urge again the adoption of the bill introduced by Sen Albert Gore (D-Tenn.) proposing $400 million for federal construction of three large-scale power reactors and several smaller ones. The same bill passed the Senate last year, but not the House.

Republicans contend the need for "maintaining world leadership" is merely a coverup for the Democrats' real purpose—to establish public power in the atomic energy field.

Not to be overlooked is the Democratic dislike of AEC Chairman Lewis L. Strauss. Democratic strategy therefore calls for a three-pronged drive aimed at both Strauss and the current atomic power program. They want to:

- Tear down the record of achievement Strauss will present Feb 19, and which is largely reflected in AEC's twenty-first semi-annual report just released.
- Block AEC appropriations request in the House Appropriations Committee on the grounds that the Atomic Energy Act does not allow AEC to assist private industry in atomic power projects. This, if successful, would force AEC to go to JCAE for legislation enabling continued assistance.
- Get approval of a JCAE hearing aimed at finding AEC guilty of issuing a construction permit for an allegedly unsafe atomic power project (Power Reactor Development Co's Lagoona Beach plant). If such a hearing were successful, it would strengthen the Democratic argument that the government should build the proposed fast breeder reactor instead of PRDC.

Strauss, backed by Republican members, will fight back. These will be his big guns:

- His third round invitation to industry to build two large-scale and three smaller reactors for completion by June 30, 1962, is being met. The Pennsylvania Power & Light-Westinghouse Group has covered him on the aqueous homogeneous reactor, one of the large units. Another utility group is making plans for the other large unit—a natural uranium reactor. At least six utility groups are prepared to make proposals on the three small-scale reactors.
- AEC has experimented with nine reactor types, four are under construction and five more are planned (a greater variety than any other country in the world).
- Eighteen prototype power reactor plants are in various stages of advancement.

There's no doubt that the Democrats will go all out to pass the Gore bill. They lost their fight by only 12 votes in the House last year. They will be up against the same forces this year—Republicans, the Administration, and the utility and coal industries.

There is this much in favor of the Administration position this year: Republican opposition on the joint committee has solidified and coal industry opposition is better organized.

NUCLEAR NOTES

In 25 years the U. S. will need 50,000 nuclear engineers, compared with the five thousand available today, predicts Dr Gunnar Randers, atomic energy adviser to the United Nations secretary general.

Britain's Lord Chandos, chairman of Associated Electrical Industries, Ltd, visited Montreal recently with one major objective: To feel out the future Canadian market for gas-cooled graphite-moderated nuclear power stations of the Calder Hall type.

Errata Sheet Corrects EW's Statistical Report

In Electrical World's Annual Statistical Report on the electrical industry, errors were made in the listing of new capacity additions (page 150) for Boston Edison Co, New England Electric System, Yankee Atomic Electric Co, and Holyoke (Municipal) Gas & Electric Division. Effect of these errors is to make the total additions now planned for the New England region 1,686,600 kw instead of 1,561,600 kw as given, and to make the South Atlantic region total of additions now planned 7,633,685 kw instead of 7,758,685 kw as given, and finally to make the total U. S. hydro additions now planned 15,682,150 kw and steam additions now planned 43,893,050 kw. There is no change in U. S. grand total. Errata sheet available on request.

DR ROBERT F. BACHER

MARION W. BOYER

DR AUGUSTUS B. KINZEL

Meet EEI's New Nuclear Task Force Team

Five noted scientists to help six utility executives on recently organized nuclear power agency

Edison Electric Institute, as part of its program to further the development of nuclear power by electric companies, has appointed five outstanding scientists and engineers to serve on its Technical Appraisal Task Force on Nuclear Power.

The five experts, who will work with six utility executives previously appointed, are Robert F. Bacher, physics professor and director of Norman Bridge Lab, California Institute of Technology; Marion W. Boyer, director of Standard Oil Co (N. J.); Augustus B. Kinzel, vice president of research, Union Carbide & Carbon Corp; Henry D. Smyth, chairman of Princeton University's scientific engineering research board; and Harry A. Winne, retired vice president-engineering, General Electric Co.

The Task Force, organized last September, is headed by James F. Fairman, vice president of Consolidated Edison Co. Its principle functions are:

1. To review continuously the progress of research and development of importance to the achievement of competitive nuclear power.

2. To study and report on all power reactor programs and projects.

3. To study and appraise the technical and economic factors and the results to be achieved by the design and construction of prototype or full-scale nuclear plants.

4. To act as liaison with members of any nuclear reactor evaluation group that may be set up on a national level.

Dr Bacher, a commissioner of Atomic Energy Commission from 1946-49, entered the atomic field in 1940 as a staff member for five years of the radiation laboratory of Massachusetts Institute of Technology. During that same period, in 1943-44, he also headed the Experimental Physics Division of Los Alamos Labs, working on the atomic bomb project.

Boyer, AEC general manager from 1950-53, began his career in 1921 as a high school instructor of science and mathematics. Aside from his term with AEC, he has been with the Standard Oil organization since 1927. He became a vice president in 1936.

Dr Kinzel, chief consultant in metallurgy to AEC's Los Alamos Labs since 1943, has been with UC&C Research Labs, Inc, for the past 30 years. He rose from chief metallurgist to vice president and has been president since 1948. He was also vice president of Electro Metallurgical Co from 1944-54.

Dr Smyth, AEC member from 1949-54, joined the Princeton faculty in 1924 and served as physics department chairman from 1935-50. As former consultant to the Manhattan District project he wrote the official report on the wartime development of the A-bomb.

Dr Winne is now chairman of the Technical Advisory Panel on Atomic Energy in the Defense Department and also heads the National Science Foundation's Divisional Committee on Scientific Personnel and Education. His 43-year career with GE began in 1910 as a student engineer and culminated in his election to the vice presidency in 1941. He held this post until retiring in 1953.

In addition to Fairman, the following utility executives also serve as members of the Task Force: James B. Black, board chairman of Pacific Gas & Electric Co; Walker L. Cisler, president of Detroit Edison Co; Herbert J. Scholz, board chairman of Southern Services, Inc; Philip Sporn, president of American Gas & Electric Co; and William Webster, executive vice president, New England Electric System.

DR HARRY A. WINNE

DR HENRY D. SMYTH

FENGMAN STATION, CHINA'S LARGEST OPERATING POWER PLANT, IS SLATED FOR RENOVATION AND MORE CAPACITY

Behind Bamboo Curtain: Determined Activity

The following story is based on information contributed by Chen Chi-yuan, director, designing department, Ministry of Electric Power Industry for Communist China—The editor.

China's power industry is going through a reconstruction phase and appears to be on the upswing—both in increased generation capacity and in the manufacture of power equipment.

The first Five-Year Plan, which ends this year, specifies that the nation's generation capacity be doubled from 2,050 Mw (at the end of 1952) to 4,050 Mw at the end of this year. Mao Ho-nien, chief engineer of the Ministry's Thermo-Power Construction Bureau, says it is expected that these figures will be "definitely exceeded."

(China, by way of contrast, had a population in 1953 of about 463.5 million. Estimated United States population for 1957 is 170.8 million. China's total capacity at the end of 1957, assuming successful completion of the Five Year Plan, will be 4,050 Mw compared with an estimated end-of-year U. S. capacity of 130,700 Mw. If the Five Year Plan is realized, China this year will generate 15.9 billion kwhr. U. S. will generate 573 billion.)

Manufacturing Industries Needed

The expansion called for in China's first Five Year Plan includes construction of 16 hydro and 76 steam plants, renovation of existing plants, installation of 10 high-voltage transmission networks, and expansion of the power equipment manufacturing industry.

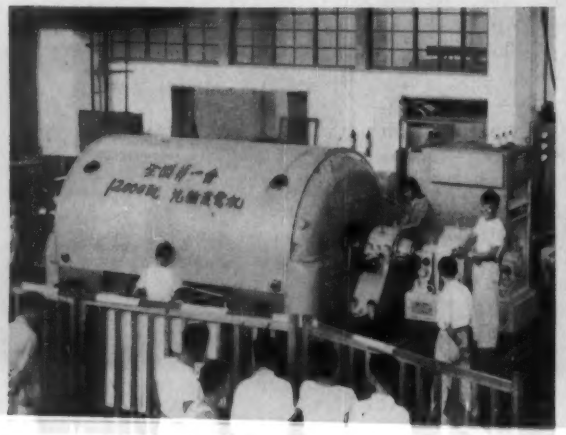
Heaviest concentration will be placed on steam plants. Nineteen will be extraction stations. Steam pressure for all new stations is over 570 psia; and for 17 of them, over 1,450 psia—covering 47% of the total projected capacity.

The plan calls for great development of the Yellow River in the future with 46 multi-purpose projects to be built. The plants will yield 23 million kw ultimately. Major hydro developments include construction before 1967 of Sanmen Gorge and Liukia Gorge, both with an ultimate capacity of 1,000 Mw, and renovation of Fengman hydroplant—largest now operating. By 1957 Fengman should be generating 567 Mw.

China also seeks to decrease coal consumption to 1.29 lb/kwhr; line losses to 10.73%, and raise annual equipment usage to 4,550 hours.

Strong emphasis is now placed on China's need to develop domestic manufacturing industries. The plan calls for construction of boiler, turbine, and generator factories; motor, cable measuring instrument, and carbon brush manufacturing plants; and factories for renovation of switchgear and transformers.

12,000-KW STEAM turbine generator, first of its kind made at Shanghai Power Equipment Plant, gets its first trial run



WHEEL of a 12,000-kw hydro electric generator is being made in Harbin Power Equipment Plant in Northeast China

Power Shift Fails

An attempt to shift power from the East Coast to the West Coast failed Jan. 27 as synchronizing current became too heavy. In a pioneer experiment in the U.S., Tennessee Valley Authority dispatched power to Bonneville Power Administration over a hookup having a pivotal point in Fort Peck, Mont. The hookup lasted six minutes. A second try yielded a hookup which lasted one minute.

Fewer Big Blows Coming

Electric utilities can expect fewer hurricanes in the U.S. for years to come, predicts Gordon E. Dunn, the U.S. Weather Bureau's chief hurricane forecaster in the southern U.S. He said a 20-year hurricane cycle—which has brought high storm incidence to the U.S. for the last few years—should be ending in 1958. He foresees "one or two" a year during the lull.

GE Drops Water Heaters

General Electric Co is withdrawing from the electric water heater business because the market no longer is considered profitable, the company reports.

However, Hotpoint will continue its aggressive manufacturing, marketing, and research programs. "Factory production planned by the company will insure an ample supply of Hotpoint water heaters to utilities, as well as the company's distributors and dealers," said J. C. Sharp, president. Hotpoint's Milwaukee factory will shuffle production schedules, but no personnel problems are anticipated.

When's A Boy Not A Boy?

When is a boy—legally a minor—actually responsible for what he does? This may have been one key to a recent negligence suit filed against Rochester Gas & Electric by the father of an 18-year-old youth. The boy was electrocuted accidentally after climbing a 160-ft highline tower at 1 A.M., July 14, 1954.

New York State Supreme Court Justice C. O'Brien ruled in favor of RG&E. He found that the tower's bottom ladder rung was sufficiently high—8 ft from the ground. Four danger signs are posted at the tower's base. A street light illuminates at least one of the warnings at night. No previous accidents or climbing ventures had been reported in the tower's 48-year history.

The judge pointed out that this boy was "almost a grown man." Referring to the boy's academic success in high school, Judge O'Brien wrote: "He wasn't an intellectual giant . . . but I don't think he would have to be a Ph. D. to read these signs which, in red, warned of danger and instructed him to keep off."

For Miners: Safe Light

Coal miners soon may lay aside the hard-hat lamps which for decades have shed light on black coal seams deep in the earth. The U.S. Bureau of Mines reportedly has approved a fluorescent lighting system believed safe for coal mines. Tests conducted in Pittsburgh caused no explosions when tubes purposely were broken in explosive atmospheres of gas and coal dust. Until now, it was felt that fire and explosion risks created underground by electric lights outweighed the hazards of poor visibility.

Suez Hits Florida—Again

After jacking up its power rates 3% because of higher fuel oil prices, Tallahassee, Fla., (not Jacksonville as reported in EW, Jan. 28, p 107) sought and got a second 3% rate increase in two weeks to cover further oil price hikes. The new ordinance passed by City Council boosts power rates ½% when oil climbs 5¢. Now all of Tallahassee Electric Dept's rates are tied to fuel oil prices. Despite this, not a single protest was registered at a special hearing called expressly for objections. "They've got confidence in us," said City Manager O. B. Hopkins proudly.

Meanwhile in Jacksonville, Utilities Commissioner J. Dillon Kennedy and associates are trying to figure ways of staving off a rate increase. As of now, only the industrial rate (covering about 1/23 of the load) is tied to fuel prices. Kennedy, who initiated a 7½% rate decrease in 1951, hopes to stall off any increase for the next few months in hopes fuel oil prices may fall back in line.

Florida P&L, also suffering from the Suez-induced oil shortage, will increase rates by 5½% instead of 2½% as first predicted. The 2½% boost will be applied to meter readings after Feb. 10. At this time, FP&L will be burning oil costing 30¢ more a barrel, bringing fuel cost to $2.45 a barrel. By March 10 it will be using oil that has increased a total of 65¢ a barrel, so rates will be adjusted upward an extra 3%.

Pole-Cat Study

Seattle City Light linemen rescued 114 "scared" cats from poletops during 1956, a recent study shows. The study was made after some indignation was aroused because one cat had a lengthy wait for rescue.

Doble Talks Cover Shop, Test, Maintenance

Boston conferees discuss insulating oil technology, high-voltage transmission, bushings, arrester standardization, and high-voltage oil breakers

A symposium on electric utility shop facilities, testing practices, and preventative maintenance featured the Doble Engineering Co's 24th annual client conference Jan. 14-18 at Boston. Other sessions disclosed advances in the technology of insulating oils, high-voltage transmission, and testing.

O. R. Compton, Virginia E&P Co, briefed plans and objectives for a new shop planned for completion next year. Primary functions of this shop are: Salvage of pole-line and substation equipment, and testing and maintenance of power and distribution transformers, circuit breakers and oil switches, reclosers, sectionalizers, and lightning arresters. Expected work load is 50 distribution transformers per day, using assembly-line methods, and 50 to 100 circuit breakers and power transformers per year.

Testing Extensive

Symposium speakers reported methods used and experiences obtained in existing central service shops on six utility systems. All six reported extensive testing to determine maintenance needs, facilities to recondition, and proof testing before return to service. But differences were the use by several of local utility or contractor shops for repairing distribution transformers and field testing and maintenance of circuit breakers at remote substations of another system.

Cooperative research is producing insulating oils better suited to higher thermal and electrical stresses of future equipment, said F. C. Doble, president of Doble Engineering Co. Emphasis today is on long sludge-free life instead of low rate of sludging, he said.

The need is for a new testing procedure to compare new with known oils which have demonstrated long service life, Doble said. Insulating oil is predominantly an unstable napthenic hydrocarbon stabilized and protected by aromatics. Nature provides these aromatics in some oils, and care is required during refining to preserve them because today's inhibitators can only partially replace them. The most reliable test for these aromatics, Doble said, is use of an oxidation comparator on the oil itself.

Reconditions Oil

Used oil is reconditioned by Virginia E&P in a central plant to attain renewed life comparable to new oil at a cost of 7¢ per gal, said O. R. Compton. Steps in the process are:

1. Washing used oil with a water solution of trisodium phosphate agitated with compressed air.
2. Allowing wash solution to settle out of cleaned oil.
3. Centrifuging out excess moisture.
4. Percolating and recirculating oil through Fuller's earth.
5. Testing for 30-kv minimum dielectric strength, neutralization number under 0.1, and interfacial tension of 30 dynes per cm.
6. Adding DBPC inhibitor.

Philadelphia Electric Co uses interfacial tension as its criterion for oil reconditioning, with 18 the minimum acceptable value, reported W. C. Whitfield Jr. Equipment used is trailer mounted for field use and includes a pressure percolator, preheater, vacuum dehydrator, and testing apparatus. Cost of restoring oil to a neutralization number under 0.1 and interfacial tension over 30 dynes per cm, then adding DBPC inhibitor to 0.3% by weight, averages 15¢ per gal.

Moisture Not Harmful

Condensation of moisture into a transformer from its gas-oil seal is not a serious problem, according to preliminary tests reported by W. R. Graham, Texas Electric Service, and G. W. Armstrong, Doble Engineering. The Texas tests did not encounter dew points near ambient and top-oil temperatures. The Doble tests indicated that the amount of moisture has little effect on transformer insulation or oil.

P. L. Bellaschi, consultant, noted encouraging trends in bushing design, manufacture and standardization; important lightning arrester standardization as related to switching surges; material improvement in two-step BIL reduction; increased use of 230, 300 and 345 kv; and a pioneer attempt to introduce corona ionization requirements in specifications for transformers. Bellaschi said that over 1-million kva of large power transformers failed in service in the past 18 months. But American made transformers have shown up well in regard to corona.

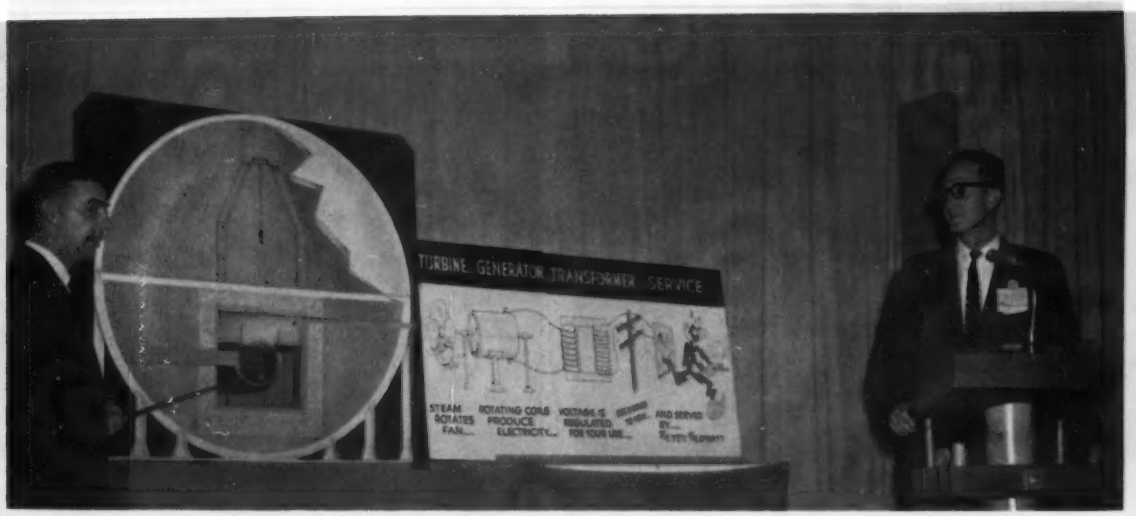
W. J. Bridegam, Gilbert Associates, reported successful use of 250-w infrared lamps to remove moisture from the porcelain surface of bushings.

Surface contamination from moisture will be prevented by insulating low-voltage capacitance tap outlets with glass instead of molded compound, said J. A. Van Lund, General Electric Co. C. A. Duke, TVA, cautioned against putting too much reliance on power-factor readings of 0.3 to 0.6% in testing oil-filled bushings.

Breakers Uprated

Tests on high-voltage circuit breakers indicate that all possible precautions should be taken before installation to insure that interrupters, operating rods, and guides be kept dry during shipment, storage, and filling with oil. Losses in cross-guide members and operating rods indicate hazardous conditions, said A. L. Rickley and R. E. Clark, Doble Engineering.

T. E. Haynes, Union Carbide Nuclear Co, described the successful uprating of 45 161-kv oil circuit breakers from 3,500 and 5,000 Mva to 10,000 Mva. Cost was $1,343,500. Job required replacement of almost everything but tanks and current transformers. Timing tests confirmed the 5 to 3-cycle design and ability to reclose at high speeds.



By Tailoring Script to Audience Levels . . .

'Fabulous Atom' Show Wins Acclaim

Greater knowledge and appreciation of the industry's role in the nuclear power field can be gained by dramatizing the atom's peacetime uses. This is demonstrated by initial success and public acceptance of "The Fabulous Atom," a 45-min stage production developed by Public Service Co of Colorado.

Since its inception early last year, the show has played at junior high schools, an industry association conference, an annual meeting of a rural electric cooperative, and to PS employees and families. The company is presenting the show to Denver senior high schools this year.

Public reaction has more than repaid the company for its efforts. Comments about the show by women viewers have been highly favorable. Before-and-after surveys of 7-9th grade students revealed the show increases knowledge of peace-time atom uses.

"The Fabulous Atom," written, produced, and presented by employees, has these goals: To give the public a better understanding of the atom; tell and demonstrate promises of an atomic future; and inform the public that the industry, and specifically PS, has interest and responsibility in nuclear power development.

To accommodate variation in interest and intelligence levels among audiences, the "message" portion of the show is tailored to the group. Adults hear how the industry has accepted opportunities to enter the nuclear power field. The show points out that while "there are those who would prefer total governmental development of nuclear power, and who consequently criticize the present (industry) program as being inadequate . . . cooperation between industry and the AEC has resulted in completion, development or applications covering 214 nuclear reactors, compared to less than 75 for the rest of the world."

For Students—A Challenge

For student group presentation, the speaker advises "there is still much to do and to learn, with too few really able, trained people to do it. Our atomic future is dependent upon young men and women . . . to meet this challenge of tomorrow."

Presentations begin with the showing of an atomic explosion, followed by quoting President Eisenhower's view that the atom must be stripped of its military casing and adapted to the arts of peace. The first demonstration explains the structure of an atom through the use of visual aids and a short film. This is followed by applications of radio-active isotopes in medicine, agriculture, and industry in general.

To emphasize how nuclear power will fit into the production of electric power, operation of a conventional fuel-fired plant is explained. Then it is demonstrated clearly that the nuclear reactor will replace only the steam plant boiler.

Within this last phase of the program, the audience-tailored message is delivered. For student groups, a tape recording from AEC's National Reactor Testing Station by the Public Service representative to the Rocky Mountain Nuclear Power Study Group emphasizes personnel needs and challenges in the atomic field. Progress made in national research and responsibility assumed by the electrical industry is stressed.

For adults, the speaker elaborates on the industry's accomplishments to date and current program of building prototype and full-scale nuclear power plants. He explains that practical operating experience is needed before the industry can proceed with an expanded nuclear power program.

"The Fabulous Atom" is presented from a complete, portable stage, which has a public address system, curtain, steel frame and lighting. The show requires a minimum space of 10 x 23 x 10 ft. Set-up time is four hours for four men, with about an hour required for take-down and packaging.

Presentations are made by Jack Reed, speaker (right, above) and Dan McNellis, demonstrator. Demonstrations are made on the 9 x 18-ft main stage. A sheer curtain and lighting effects eliminate need to open and close the curtain for demonstrations. Directly above the speaker is a 48-in. translucent screen on which film strips and slides are projected.

A—Conveyors deliver meters to the test room

B—Test tables include stroboscopes and counters

New Meter Shop Speeds Testing

METERING
Maintenance

Chain conveyor, adequate working facilities provide testing and maintenance capacity for 600,000-meter system

S. B. VAUGHN, Meter Dept Supv, Florida Power Corp, St. Petersburg, Fla.

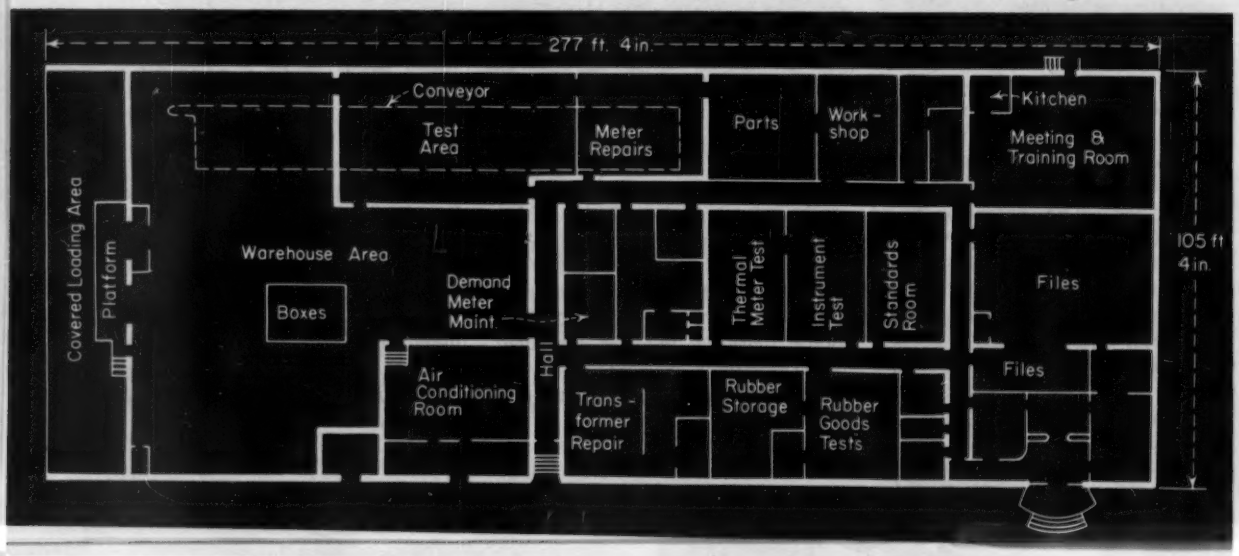
Designed to meet fully 1965 requirements for handling and testing 600,000 meters, instrument transformers, and rubber goods, a new and thoroughly modern building of Florida Power Corp features a 288-ft conveyor of the endless chain type. The 432-meter conveyor originates in the receiving area; passes through the cleaning, testing, and repair areas; and returns through the test section to the shipping area. New meters, over 20,000 per year, are tested when purchased and periodically thereafter. Except for meters at large commercial and industrial installations, all meters are routed through the shop for full check-up, cleaning, maintenance, and testing.

Incoming meters from the 33 company districts receive clean covers in the receiving area and move via belt conveyor to the test room (Photo A). Lifted from the belt to test benches (B) the meters are tested to determine the "as found" calibration. A 1,500-v breakdown test is applied. If major repairs are not required, minor part replacements, such as registers, jewels, and bearings are made by the tester. The "as left" test is then completed, using stroboscopes at full load and electronic counters at light load. The meter is replaced on the conveyor and sent to the packing table in the warehouse.

Meters needing major repairs are returned to the conveyor with requirements noted on the test sheet placed in the cover. These meters are picked off the belt in the repair room (C), reconditioned, and returned by conveyor to the test room.

Covers removed from the meters in the receiving area go into stainless steel baskets which are immersed into one compartment of a stainless steel sink. Here water containing strong detergent is heated by two 1,500-w elements and agitated by air jets. Other com-

Building floor plan shows integration of specialized facilities for meter testing



C—Meter repair room is next on the conveyor

D—Instrument transformers have special test room

partments provide rinse water, the last at 180F to achieve air drying of the covers.

Instrument transformers are diverted to a separate room (D) for test. Here is equipment to test ratio and phase angle at currents from 5 to 5,000 amp and voltages from 120 to 14,400. Dielectric tests are made with a 50-kv transformer.

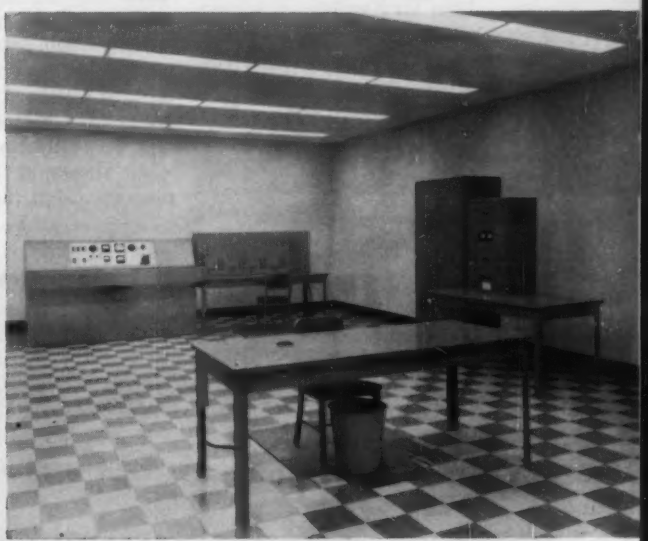
In the standards laboratory a precision wattmeter, voltmeter, ammeter, and three watthour standards are connected permanently to a terminal panel. Rotating standards are housed in an insulated box at a constant temperature of 40C. Each year a reference voltmeter, ammeter, wattmeter, and watthour rotating standard are sent to the National Bureau of Standards for certification. Reference meters and standards are compared with precision meters and standards monthly.

The standards lab has an ac power unit supplying regulated current, 0 to 100 amp, and regulated voltage, 120 to 240, to the terminal panel at any desired power factor. Auxiliary equipment includes a standard clock with a 60-sec interval contact relay, precision current and potential transformers, and a chronograph for recording and comparing time intervals. A short wave radio picks up time signals from Arlington. Temperature is maintained at 77F with 65% humidity.

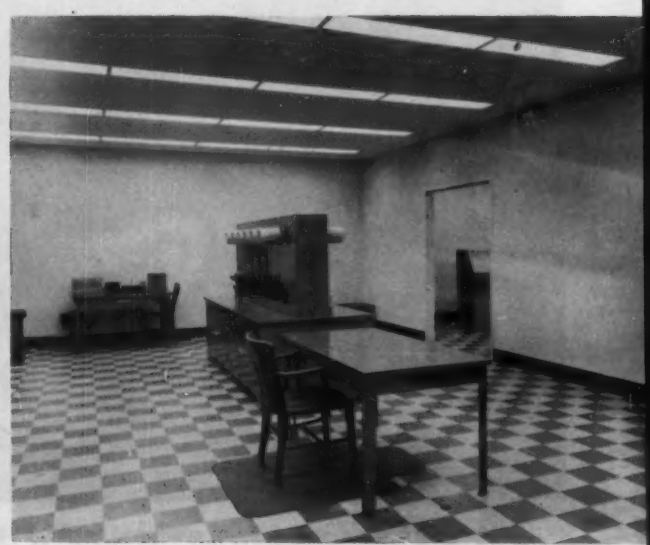
All portable instruments are compared with reference standards in the instrument test room (E) where an ac power supply delivers regulated current, 0 to 200 amp, and regulated voltage, 120 to 240 v. Unregulated 4-wire 120/208 v and 4-wire delta 120/240 v are also available on the instrument test table. In addition, the instrument test room has a dc supply, 0 to 10 amp and 0 to 150 v.

Demand meters are tested in an adjoining room (F) using the regulated supply from the instrument room. The table will test 15 type "S" thermal meters and 6 type "A." Demand meters for load surveys can be tested also.

The records section contains all files pertaining to meters, transformers, portable instruments, etc, cross-filed by company and serial number. The filing system shows the physical location, availability, and test status of each meter. Installed on the tops of filing cabinets are phone-jacks. These enable clerks to answer telephone inquiries without removing records from the file, eliminating extra trips to and from particular files for additional information.



E—Regulated current and voltage are available



F—Thermal meters are checked in this area

Microwave Links Protective Relays

RELAYING
Design

Affords adequate protection for pipe-type cable with a line-of-sight path of 4 miles in a compact city service area

JOHN J. EGAN, Supervising Engineer, Production Dept, **K. O. STEN**, Supervising Engineer, Engineering and Construction Dept, **J. E. HURLEY**, Engineer, Boston Edison Co, Boston, Mass.

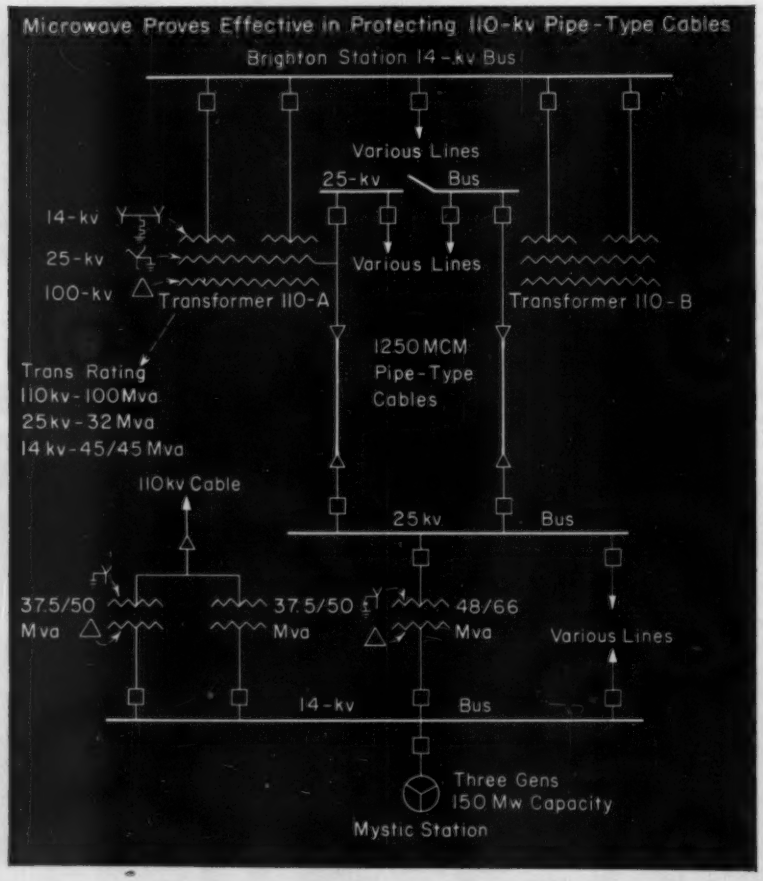
A microwave system for protective relaying has a definite application even for a small compact metropolitan area such as is served in the urban section of the Boston Edison Co. Equipment of this type has operated satisfactorily in protecting two 110-kv, pipe-type cables between the Mystic generating station and the 200-Mva Brighton substation. The microwave path, only 4 miles long, produced no serious problems. A line-of-sight path is used without extremely high towers. The system was tested and placed in service before completion of cable work.

The reliability has been extremely high after one year's operation. It has not been affected by adverse weather conditions, and operation has indicated that functions may be easily added to the system.

As shown in the one-line wiring diagram, each pipe-type cable was connected initially to the 25-kv winding of the Brighton transformers. This arrangement necessitated a transformer tripping scheme from Brighton to Mystic to protect the Brighton transformers. High-speed relaying protects the pipe-type cable. It was also agreed to have provisions for supervisory control, voice communications, and telemetering equipment.

Microwave was considered the best communication system for these requirements because it is reliable, flexible, and economically justifiable. Operating experience had indicated that leased telephone circuits and pilot-wire cable have not reached a degree of reliability for these requirements. Power-line carrier was ruled out because of lack of experience and information on the application of carrier to pipe-type cable.

Adopted from a paper presented by the authors at AIEE Winter General Meeting, New York, N. Y. Jan. 21-25.



110-KV PIPE-TYPE cable was initially connected to the 25-kv windings of the substation transformers. Line-of-sight microwave transmission is employed

2,000-Mc System Used

A 2,000-mc system was installed as most suitable from an overall viewpoint. A 960-mc system would not provide enough channel space to handle future requirements. It was not selected even though it was realized that a few protective relaying schemes in this band had been successfully applied to overhead transmission lines. The 2,000-mc system would permit future expansion, and its circuitry has a longer service record than the 6,700-mc equipment's.

The highest degree of reliability possible was a primary concern, and to accomplish it, stand-by equipment was provided.

The system consists of two parabolic reflector-type antennae mounted on towers and spaced approximately 30 ft apart in a vertical plane. These parabolic reflectors are 6 ft in dia. Primary transmitters and receivers are connected to the top antenna, and the stand-by or diversity equipment to the lower antenna. Communication in one direction is at the same frequency for both primary and stand-by paths,

but communication in the opposite direction is 50-mc removed. The primary transmitter is normally connected through a coaxial relay to its antenna. The stand-by transmitter operates at full-power output through its coaxial relay into a dummy load.

Primary and stand-by receivers are connected at all times to their own antennae, both receiving the signal from the opposite terminal. The primary signal is normally used with provisions for transfer to the stand-by signal in event of trouble in the primary circuit. Upon correction of trouble the primary signal is used again. The antenna of the stand-by receiver is spaced 30 ft away from the primary receiver antenna, so that the possibility of the same fade occurring simultaneously at the stand-by antenna is unlikely.

The path between the two upper parabolas is line-of-sight and operates with a 45 db fade margin, but some path obstruction between the two lower parabolas results in a fade margin of 30 db.

The multiplex equipment is the frequency-division type, consisting of 30 wide-band channels operating in the 300 to 600 kc range. Seven are in use for protective line relaying, transfer tripping, supervisory control, and voice communication with provisions for future continuous telemetering.

Sequential tone-control-type supervisory equipment is used to control breakers at Brighton, for selective telemetering, for the receipt of door signals and miscellaneous alarms, and for initiating tests of transfer trip channels and removing the high-speed relaying from service.

In the line relaying scheme, the frequency-shift equipment operates continuously on crystal frequency which is the hold frequency for the high-speed protective relays. The two transmitters and receivers in this line relaying scheme are continuously locked up in a chain on the hold frequency for monitoring purposes. A failure of any of the two transmitters or receivers unlocks the chain and sounds an alarm at Mystic. The protective line relaying is an adaptation of the distance-type directional-comparison carrier-current relaying.

On external line faults, the protective relays which "see" fault current flowing against direction maintain the frequency-shift transmitter at that terminal on the hold frequency. In this manner the opposite terminal, which "sees" fault current flowing in the tripping direction, is prevented from tripping high speed. On internal faults, the protective relays at each terminal "see" fault current flowing in the tripping direction and shift their corresponding transmitters to the trip-permissive frequency which allows high-speed tripping at each terminal.

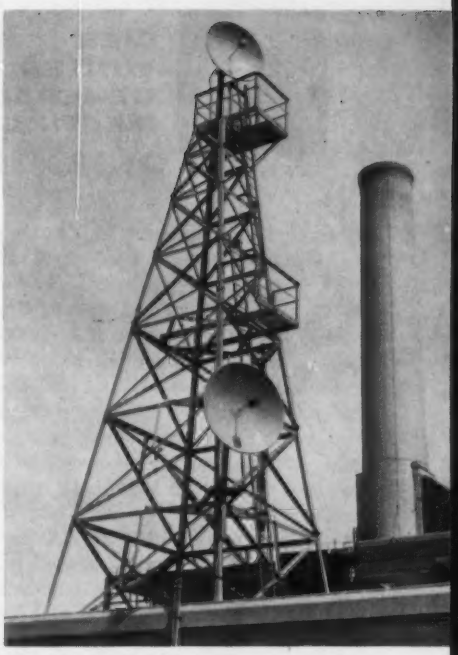
The transfer tripping scheme for the protection of each Brighton transformer is a dual channel, consisting of two transmitters at Brighton and two receivers at Mystic. This frequency-shift equipment normally operates 500 cycles below crystal frequency. A transformer differential operation trips the Brighton breakers directly and shifts the frequency shift transmitters upwards 500 cycles to crystal frequency. The receipt of this shifted-frequency signal on both receivers at Mystic results in a breaker operation, clearing the transformer fault.

Drive Is Ac Motor

Two 5-kw, continuous-power sets and associated controls have been installed at each terminal. Each set consists of an ac driving motor, an ac generator, and a dc motor, all coupled together on a common base. Normally the set is driven from the ac motor. But on loss of the ac supply to this driving motor the dc motor is switched immediately onto the 130-v station battery.

No major troubles have arisen. Initial source of trouble occurred in the frequency-shift transmitter crystal ovens. Their failure to maintain proper temperature resulted in the protective temperature-limit switch shutting down the transmitter with the resultant loss of signal at the receiver location and of annunciation at Mystic. The faulty operation was rectified by installing different type crystal ovens.

Three months after it was placed in operation, the relaying scheme failed to block on an external fault. Extensive tests indicated that contact bouncing in the starting element of the protective relays was causing momentary losses of holding current. The trouble was in the relay, not the microwave equipment. It was ascertained that contact bouncing occurred only at low multiples of the tap setting.



ANTENNAE for primary and stand-by circuits are mounted on same tower

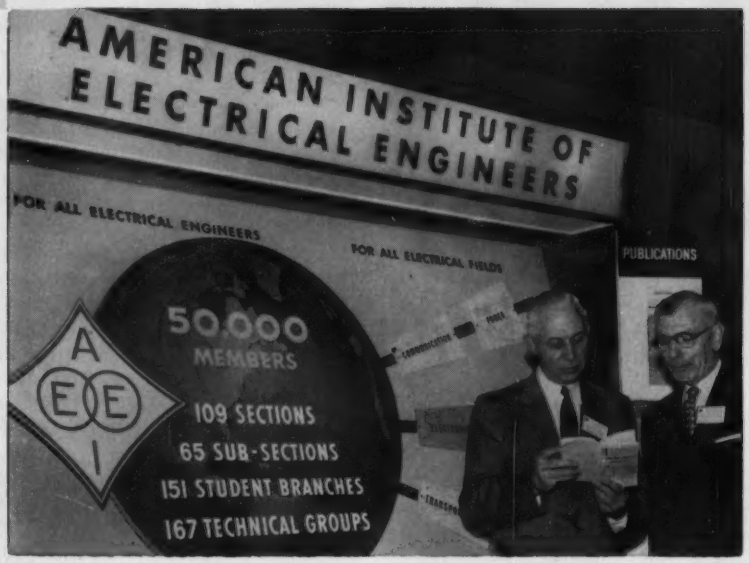
The problem was solved by introducing a time constant into the relay circuit in the form of a 4-microfarad capacitor and a 250-ohm resistor. The time interval is of sufficient duration to override any contact bouncing of a protective relay starting element.

The next major trouble occurred in August 1956. Simultaneously with an extremely heavy 14-kv cable fault off the Brighton bus came a complete shutdown of the microwave system, including both primary and stand-by equipment. It later proved fortunate that a supervisor happened to be in Brighton station. He heard a high-pitched sound coming from within the building and found that the microwave motor-generator had transferred to the dc motor. Upon checking the microwave equipment at Brighton, 19 fuses were found blown, and five rectifier tubes and one resistor were found defective. It was obvious the microwave equipment had been subjected to transient overvoltage.

Subsequent tests on the microwave motor-generator set consisted

(Continued on page 138)

AIEE WINTER GENERAL MEETING



System Growth Problems Hold AIEE

Engineers focus on EHV transmission, bulk-power substations, and system engineering to restore capacity balance with large generators, look to research to sharpen methods

Extra high voltage transmission, bulk power substations, and system engineering shared the focus of the American Institute of Electrical Engineers at its Winter General Meeting at New York late last month.

These subjects, among the 400 papers in 94 sessions on the meeting program, held the most interest for utility engineers. And in these sessions they girded themselves for the next phase of utility expansion—conveying the output of large, highly economical power plants already projected or under construction to the major load centers of their systems.

Featured facets of this emphasis on power system development were:

- Disclosure of the program for research in EHV transmission at high altitudes at the Leadville, Colo., test site.
- Clarification of the parameters of corona and radio interference from high-voltage lines and methods for controlling its effects.
- Justification of wood-spar H frames for 230-kv single-circuit lines.
- Verification of microwave's advantages as a tool for relaying transmission networks.
- Evaluation of progress in insulation coordination for high-voltage lines and substations and designation of areas requiring renewed engineering attention.
- Arguments for a 2-BIL-step cut in insulation for transformers on effectively grounded systems.
- Adoption of supervisory control for major switchyards at generating stations to avoid congestion in the station control rooms.
- Completion of automatic load control for economic dispatch of a system with 35 generating units.

Research sessions lacked the glamor of those devoted to the bulk power program but they, too, contributed to the success of the meeting. Of particular interest was a survey of college engineering students which reveals little interest in electric utility careers. The program described by one major utility reflects its management's determination to make utility careers attractive to young engineers before today's trends impair its ability to cope with tomorrow's pressing demands. The nature of these demands was demonstrated by predictions of transmission needs greater even than those discussed in EHV papers and, in other sessions, by progress reports on liquid dielectrics and insulating materials.

Tests Measure EHV Corona and Radio Noise

- **EHV test line in Rockies to evaluate effect of altitude on corona and RI**
- **Method of calculating corona and RI performance of conductors proved in tests**

Preoccupation of transmission engineers today with evaluation of radio influence and corona performance of extra-high voltage lines was apparent in all AIEE transmission sessions. Studies involving field tests, laboratory investigations, and calculations were represented in reports on the subject. Although it is still too early to draw lasting conclusions from current studies, results disclosed promise early clarification.

A large-scale field research program recently undertaken by Public Service Co of Colorado and several manufacturers to evaluate corona, radio influence, and mechanical line design of extra-high voltage lines at high altitudes was the subject of three companion papers. L. M. Robertson, Public Service of Colorado, and C. F. Wagner and T. J. Bliss, Westinghouse, explained that the project grew out of a lack of data on the effect of altitude on corona at or above 10,000 ft. Data on generation of radio noise by transmission lines at high altitudes is similarly scarce.

The test station and line have been built near Leadville, Colo at 10,600 ft altitude. The line, which is 6,700 ft long, uses only single-phase voltage which can be varied in 34 steps from 100 to 300 kv above ground. Thus three conductors can be studied concurrently on structures of practical, three-phase, single-circuit design. Test conductors consist of two bundle-conductor combinations, one using 0.92-in. and the other 1.4-in. ACSR, and one 1.65-in expanded-ACSR conductor.

The 1.65-in. and the bundled 0.92-in conductors were selected to give a comparison with Tidd test data but it is not expected that either will give satisfactory performance. It is hoped that the ultimate optimum design for a 345-kv high-altitude line will be bracketed by the two bundled combinations to be tested.

Standard Insulators Used In Leadville Line

Because these RI and corona tests are intended to evaluate conductor performance, standard insulators and hardware were selected that have RI and corona characteristics superior to the conductors, L. M. Robertson, PS of Colorado, and A. D. Lantz, Jr, Ohio Brass Co, disclosed. Suitable stress control rings were installed having radio influence voltage and corona performance superior to the characteristics of conductors.

Four types of structures have been incorporated in the 7,000 ft Leadville test line. These include a tubular steel H-frame, a steel tower, wood-pole H-frames with timber and spar members, and two special wood-pole dead-end designs. Details of these designs were discussed by Messrs L. M. Robertson, PS of Colorado; P. T. Coffin, Aluminum Co of America; H. M. Walton, American Bridge Co; R. G. Yerk, Hughes Brothers Co; O. R. Huggins and N. E. Desenberg of Malleable Iron Fittings Co. Conductor sags and tensions were based on a maximum loading of ½-in. ice, 8-lb wind at OF. All conductors have about the same final sag at 60F, 63.5 ft at 1,400 ft. Spacers for the two bundle conductors are of two types; one articulated, the other flexible.

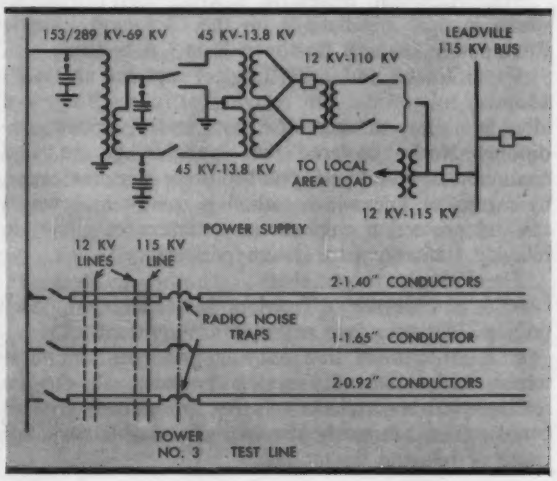
Discussion of the three high-altitude test papers centered around details of test procedure and opportunities for comparing laboratory and field tests of the effect of air density on radio interference. G. E. Adams, General Electric, observed that pressure-chamber tests show a direct relationship between critical voltage and air density with a 10% change in air density causing a 2:1 change in RI.

Measure Radio Noise on Shoshone Line

Radio noise measurements on the high-altitude, 110-kv Denver-Shoshone Line of the Public Service Co of Colorado were conducted in 1955-56. L. M. Robertson, PS of Colorado; G. E. Adams, N. R. Schultz, H. A. Gauper and T. W. Liao, General Electric, found a sharp up-turn in corona loss above 104 kv. A plot of quasi-peak RI in micro-volts per meter vs line-to-line voltage at 110 kv showed values in a range from 500 to 2,000. This more than 3 to 1 variation was attributed to noise transmitted to the test site.

Ohio Brass Company's Dr C. J. Miller, Jr, outlined a 6-step method of calculating corona and radio interference characteristics of single or bundled transmission conductors. High-voltage tests confirmed the concept of representing a bundled conductor by an equivalent diameter. The method showed a 1.602-in. ACSR conductor to be equivalent to a two-conductor bundle of

Leadville EHV Test Line



Insulation Coordination Proves Reliable

795 MCM "Drake" conductors or a 3-conductor bundle of 477 MCM ACSR "Hawk" conductors. A single 1.75-in. conductor was found equivalent to a two-conductor, 954 MCM "Cardinal" bundle.

In discussion G. H. Phillips, Aluminum Co of America, said a more comprehensive group of weathered conductors might have been produced more representative data. Robert Schlomann, American G&E, noted that Miller's were the first curves that come down to threshold values without bending. H. L. Rorden, also American G&E, saw Miller's single-conductor equivalent as a possible threat to the use of bundled conductors where cost is higher because use of a bundle would have to be justified on the basis of increased capacity rather than radio noise.

A series of radio noise tests on existing lines undertaken as an aid in selecting conductor for Detroit Edison Co's 345-kv system as reported by F. L. Taylor, C. J. Crockford and R. V. Nicholson, all Detroit Edison. Among conclusions of the tests, made in cooperation with Ohio Brass Co, were these:

1. A small change in air density causes a big inverse change in RIV.

2. An inverse relationship may exist between RIV and humidity up to the dew point.

3. Radio noise varies approximately as voltage to the 8th power.

A 345-kv line with bundled-conductors, designed for a level of 20 microvolts per meter at 100 ft, would be satisfactory for Detroit, the authors concluded. Tests on a 138-kv line of Consumers Power Co showed agreement on the inverse humidity relationship as well as on the ratio of conducted to radiated RIV at 100 ft and the authors' average radiated RI values, Brent Ottinger, Consumers Power, reported.

A study of the effects of line design on the radio interference of high voltage lines led G. E. Adams, General Electric, to conclude that interference is generated largely due to the center conductor; that lines with horizontal configuration show lower interference levels than vertical.

Laboratory observations of relationships between corona and radio influence lead GE's T. W. Liao, W. A. Keen and D. R. Powell to conclude that moist points of insulating material cause much higher corona pulses and radio noise than metallic points. They suggested that vegetation deposits on transmission conductors are more liable to cause RI than surface scars.

Present status of the 345-kv American G&E, OVEC, and IKEC systems, reviewed in an interim report by H. P. St Clair, disclosed that:

1. As system voltage levels have been raised to 345 kv, operation and RI have continued satisfactory.

2. Uncertainties about operation of 1.6 in. conductors at 345 kv have been removed.

3. Although lightning flashovers continue at high levels, service has remained excellent due to effective relaying and high-speed reclosing.

In an economic analysis of conductor selection for EHV systems, J. M. Henderson and A. J. Wood, General Electric, concluded that larger conductors than those in common use today are a prudent investment primarily because of increased circuit loadings brought about by mounting transmission costs and limited rights of way. Among other discussers, H. K. Sels of Public Service E&G took exception to some of the authors' assumptions and deplored their failure to stick vigorously to annual costs and present worth comparisons.

Decision of Virginia Electric & Power to use all-spar construction for a new 96-mile, 230-kv, H-frame line reflects 16 years of satisfactory service with 600 circuit miles of 138-kv spar-arm lines. C. C. Dodge, Stone & Webster, explained that use of twelve 10 x 5¾-in suspension insulators with 19-ft phase spacing provided coordinated design with ample margin for switching surges and effective protection against lightning.

Appraisal of Virginia E&P Co's 30-year-old, wood, transmission structures by F. W. Smith again showed ground-line decay to be the most common cause of pole failure. It accounted for 50% of the 102 poles discarded out of 1,075 in the line. Second greatest cause was woodpeckers whose borings admitted fungus.

Microwave Proves Value as Transmission Relaying Tool

Microwave for protective relaying has proved its worth in trial installations on the Cleveland Electric Illuminating Co and Boston Edison Co systems.

V. A. Nosko and J. R. Linders reported that CEI adopted microwave for relaying as a working tool after two years of successful tests under various conditions. Nosko declared that "reliable, secure, and continuously monitored, point-to-point communication by means of microwave radio" is a new tool which can aid protection engineer to minimize or eliminate relaying limitations to system performance.

The CEI tests proved that:

- "A new degree of freedom is available for integrating older parts into new system requirements.
- "Multi-terminal line relaying problems are minimized, and satisfactory system performance can be realized with microwave relaying from many system configurations formerly considered unsatisfactory because of relaying limitations."

CEI's first application of microwave relaying was on a 132-kv line terminating in a 132/66-kv autotransformer. High-speed relaying and reclosing on this circuit were required by a 100-Mva system reinforcement. Because microwave provides a reliable transfer trip channel, CEI could omit the usual circuit breaker for the auto transformer.

Second application utilizes the same microwave terminal facilities. This circuit consists of a 132-kv line, two 132-11-66-kv transformers, and two 66-kv cable circuits.

Total cost of the microwave to relay these two circuits almost equalled the savings resulting from omitting the 132-kv breaker on the autotransformer circuit.

J. E. Hurley, J. J. Egan, and K. O. Sten reported that microwave has a definite application in a compact metropolitan area such as that served by Boston Edison. The microwave system uses a 4-mi line-of-sight path to protect two 110-kv pipe-type cables.

Insulation Coordination Proves Reliable

- **Review of 25-yr evolution shows how coordination has improved insulation protection, reveals future needs**
- **Substation transformer noise is controlled by acoustic treatment of the site or of the unit**

The dynamic history of insulation coordination and its technical evolution through a quarter century—beginning with its first presentation to an AIEE audience in 1928—was at once the keynote and capstone of this year's consideration of arrester characteristics and reduced basic impulse insulation levels.

In what can only be described as a classic paper, Philip Sporn and I. W. Gross of American Gas & Electric Service Co exposed the thinking behind the original concept, traced the course of its application and the results obtained up to the present.

They observed that the thermal ability of arresters has not been given much consideration recently. Arresters must be able to discharge repeated surges as lines get longer and their stored energy increases.

The three types of voltages that insulation has to withstand; normal-frequency continuous voltage, lightning impulse voltage and switching surge voltages, need further intensified exploration, they said.

Lightning current discharge needs to be established, they said, to obtain an arrester protective level which is to be coordinated with BIL. For stations they favored 5,000 amp, noting that arresters had to pass such currents in only 3.5% of cases measured.

And finally, in a strong bid for factory impulse testing they noted that in more than 20 years no power transformers so tested have failed in service.

Two-step BIL Cut Saves at 138 Kv

Two other American G&E authors, P. S. Pugh and C. P. Zimmerman, recited operating experience with transformer insulation reduced two classes. They said experience with 27¾ transformer bank lightning seasons suggests that 138-kv power transformers having 450-kv BIL can be protected with today's 109 kv arrester on 138 kv effectively grounded systems.

E. M. Hunter, J. R. Meador and W. J. Rudge, General Electric, said that switching surge voltage, rather than lightning surge protection, is the predominating factor in the design and application of two-step-down BIL transformers.

A. M. Opsahl, Westinghouse, in analyzing insulation coordination as affected by new arrester characteristics said care must be exercised in evaluating insulation stresses other than lightning surges before full advantage can be taken of the new lower discharge voltage characteristics of station and line-type valve arresters.

In discussing the design of transformers for operating conditions, F. J. Vogel and G. W. Lengnick, Allis Chalmers, said in their opinion present fears regarding the effect of continuous voltage stresses, switching surges or unreasonable dependance on arresters should not prevent use of lower insulation levels.

Noise from substation transformers has succumbed to acoustic treatment, according to two papers presented in a transformer session. One paper concentrated on methods of absorbing noise. The other described factory-applied treatment to quiet a transformer for outdoor installation at a noise-sensitive site.

Sound treatment for a substation transformer depends upon how much reduction is needed, said A. T. Edwards in a paper presented by J. R. Leslie, both of Ontario Hydro-Electric Power Commission. Distance attenuates noise, large transformers requiring more distance. Hum is generally tolerable when its level outside adjacent residences is down to the lowest noise from other sources.

3 Methods Cure Transformer Noise

For additional reduction, Edwards suggested:

1. Buying transformers specially designed and built to reduce noise.

2. Erecting one or more walls 2 to 3 ft higher than the highest part of the transformer. These barriers cut noise 12 to 15 db at 100 ft. Extending them upward gains little and adding the fourth wall limits noise attenuation to about 10 db. A few inches of masonry is adequate for acoustic control.

3. Enclosing the installation completely is usually required to cut noise more than 15 db. Masonry walls and careful treatment of doors, windows, and ventilation ducts achieve 30 db or more. Ground-borne noise is suppressed by mounting the transformer on steel springs or special rubber pads.

Sound "buildup" within the enclosure can be cut 10 db by drilling a ½ in. hole into each cell of concrete-block barrier walls to form Helmholz resonators turned to 100-200 cps. Sound attenuation in ventilating ducts is achieved by building in more cavities.

Leslie supplemented his presentation of Edwards' paper by describing an installation adjacent to buildings in a metropolitan area where all the techniques of total enclosure had been applied.

An alternative to acoustic treatment of the substation site is use of an enclosure pre-fabricated by the transformer manufacturer. A 5,000-kva LTC unit substation of this type installed by Niagara-Mohawk Power Corp near the residence of a noise-critical customer was described by G. K. Kallenbach of that utility and M. W. Schulz Jr, and T. J. Twomey of General Electric Co.

Core and coils of this unit are of conventional design. But the tank is encased in a supplementary sound enclosure mounted on a concrete pad but insulated from it by resilient supports. Cooling tubes are mounted in a separate bank on the concrete pad and connected to the main tank with resilient pipes.

Supervisory control has proved itself reliable enough to handle transmission terminal substations regardless of size, said M. C. Hedges, Commonwealth Edison Co. As a result, it can be used to save space and congestion at generating stations. The panel occupies minimum space in the control room and connections from it to a control house in the switchyard can be a single cable, he said.

Field Prewarming and Auxiliaries Discussed

- **Cooling medium temperature and heat application rate affect field prewarming**
- **Feed pump requirements and bus transfer needs important for supercritical plants**

Large unit size is bringing numerous problems to the electrical design engineer in the generation field. Solutions to two of these problems—field prewarming and auxiliary power supplies—were offered at the session on power generation.

Effectiveness of prewarming large turbine-generator rotors is dependent upon the method used, the rate at which heat is applied, and the cooling medium temperatures. These points are concluded from a study by W. J. Gilson and M. Temoshok of GE.

Specifically they decided that the use of excitation current in the field windings appears to be the most practical and efficient method for warming because of the resulting greater penetration of heat into the rotor.

During the prewarming operation, the warming rate should not exceed 10C per hr, using excitation current, in order to achieve an effective temperature distribution in the rotor. Temoshok said that a warming rate of 7C per hr was found to be better.

The prewarming operation may be easily accomplished with little change in operating procedure except for possibly extending the time required for the starting operation. If the generator temperatures are maintained during short shutdown periods, little, if any time will be required for prewarming in addition to that normally needed for starting the turbine proper.

Warming the generator at substantial speeds is believed good practice, said L. T. Rosenberry of Allis-Chalmers. And warming at 75% speed gives better results than at 50% speed.

New Problems in Auxiliary System Design

Power plant auxiliary systems have additional requirements imposed on them by the supercritical pressure cycles and nuclear reactors, the two newest developments in power generation.

Two aspects of the auxiliary requirements for supercritical pressure units as told by A. R. Jones and C. J. Baldwin, Jr, both of Westinghouse, are feed pump power requirements and bus transfer requirements.

Boiler feed pump power requirements become the major part of the auxiliary load when steam pressures are relatively high. Auxiliary power consumed by a supercritical pressure unit at 5,000 psi is about 8.5%. In comparison for a conventional subcritical pressure unit of say 2400 psi throttle pressure, the power consumed is the familiar 6%.

Bus transfer is necessary for fans to prevent the need for boiler purging. Condensate and circulating water pumps should be transferred for a hot re-start. Boiler feed pumps need transferring to maintain circulation through the bypass systems if an immediate hot re-start is intended.

In a PWR (pressurized water reactor) plant with 100 Mw rating the auxiliary power requirement at full load is calculated to be 9.5%, according to Baldwin and Jones. For Indian Point with 130 Mw (nuclear only) plant rating, auxiliary power needs will be 77%.

A vital bus system serves both short-time and extended periods of loss of electric power. System includes a battery, ac-dc motor generator, and diesel-generator.

Eastlake Generating Station is designed for an ultimate capacity of upwards of one million kw, having four units. According to C. F. Paulus of Cleveland Electric Illuminating Co, the electrical facilities from generator terminals to existing transmission lines 2.5 miles away cost less than $10 per kw net capability.

In the electric control room, all generator controls are located on a low sloping benchboard. Top of board is hinged in front to facilitate wiring and maintenance.

Balancing Hydro Units

Balancing of hydro-electric generating units under operating conditions can be done with resistance wire SR-4 strain gages, explained H. N. Hill of Aluminum Co of America. The company operates 17 hydro plants with 47 units at speeds ranging from 90 to 600 rpm.

Two gages are used on the deflection brackets for indicating shaft and measure two times the bending strain of the bracket movement. Four are applied to the bearing supports to provide a signal proportional to the bearing reaction. They measure about 2.66 times the radical strain.

Hill pointed out that through the use of the sensitive SR-4 strain gage equipment, many days of outage for maintenance have been saved and maintenance costs have been reduced substantially.

An analysis by V. W. Ruskin of B. C. Engineering Co Ltd, Canada, indicates that over a wide range of hydro, thermal plant and fuel costs, unsaleable secondary hydro energy can be "firmed up" economically through supplementary thermal plants. Regardless of fuel costs, where gas turbine plants can be built at an appreciably lower first cost, they are more economical than conventional steam plants for "firm up" service.

CABLE ENGINEERS examine section of 230-kv pipe type cable shown by W. A. Del Mar, Phelps Dodge Copper Products Co

Economic Dispatch of Power Goes Automatic

- **Savings justify investment in load control but fall short of theoretical expectations**
- **Area interconnection delays expenditure for added generating capacity, permits economic interchange of power**

Addition of a power dispatch computer to Ohio Edison Co's automatic load frequency control has given the system efficient economic control on an automatic basis, R. H. Travers told the System Engineering and Power Generation group meeting. The computer stores incremental heat rate data for each of 35 generating units, fuel cost data for each plant, and incremental transmission loss characteristics of the system. It combines these with telemetered information of total system generation and tie-line loadings to give instantaneous solutions of the coordination equations for economic dispatch. These solutions are fed into the load-frequency control as the desired "regulating point" for each plant.

The computer has been in operation since last October. Simple computing circuits are now being added to control equipment at each plant to allocate load among the units, Travers said.

Actual savings of $23,000/year have been realized from installing automatic power dispatching equipment on the Kansas City Power & Light Co system, said E. L. Mueller. The savings, he said, would justify a capital investment of $170,000. Actual cost was approximately $120,000. Calculations indicated a possible saving up to $68,000/year with the automatic equipment but practical aspects have prevented the realization of this theoretical maximum.

Pulse Timer Locates Line Faults

Use of a pulse timer to locate faults on transmission lines saves 5 to 20 hours per case of trouble, saves labor and restores service faster on the Appalachian Electric Power Co system, H. E. McCormack told another session. Appalachian has used the timer since 1955. The set is portable and can be carried in a car and mounted in a high voltage yard or used from the car. It uses a one μ-sec pulse to produce a trace on an oscilloscope.

Results have been uniformly good on high voltage circuits. But some difficulties were encountered when the method was used on medium-voltage networks.

Several types of fault locators have been used with excellent results in Japan, S. Saba, Tokyo Shibaura Electric Co Ltd, told the session. Locator indications are within a short distance of actual faults. This greatly reduces the time required to find and repair faults in the mountainous areas.

Saba described the type C locator of which there are four installations. This locator uses a dc impulse and consists of transmission lines, relays, coupling devices, a signal transmitter, and a receiver. There are 13 locator installations in Japan, Saba reported.

In discussion R. T. Purdy, Commonwealth Edison Co, asked whether locators were uniformly accurate in their indications. He said there had been no false indications in his company's limited experience. But Saba said there had been some cases in which the locator indication was misleading.

The AIEE working group on arc furnaces reported on a survey of 52 installations. Twenty members made exhaustive studies of furnaces on their systems, the flicker problems created by furnace operation, corrective measures adopted, and the relative locations of lighting and furnace loads and their effect on flicker.

Based on actual experience with the installations studied, the relationship was established between furnace size and X_{mn}. This "mutual drop" constant was defined as the voltage drop from the generator equivalent internal voltage to the lighting load nearest the furnace. Curves were plotted showing these relationships for installations of one, two and three furnaces.

Special corrective measures usually involve separate radial lines. Other measures used were synchronous condensers; condensers and buffer reactors, series capacitors, and flicker buses.

Interconnection Saves Generation Cost

Adequate interconnection of two areas achieves approximately 15% decrease in the cost of expanding generating facilities, reported H. O. Simmons, Jr, General Electric Co. This conclusion was based on studies of two areas of equal size with initial loads of 400 Mw, 800 Mw, 16,000 Mw and 3,200 Mw in each. L. K. Kirchmayer and A. G. Mellor were co-authors.

Other conclusions from the study were:

1. Capacity required for the interconnection would be slightly greater than the size of the largest unit.
2. Additional benefits would include reduction of installed capacity because of diversity between areas, and economic interchange of power stemming from differences in incremental production costs.
3. Percentagewise the economical unit size becomes somewhat smaller as system load increases, dropping from 12-14% for an initial system load of 400 Mw to 10-12% for an initial 3,200 Mw.

In the discussion M. J. Steinberg, Consolidated Edison Co said assumption of two areas of equal load was not practical. He also asked, "What effect does unit size have on the cost of providing spinning reserve."

H. W. Phillips, Pennsylvania-New Jersey-New York-Maryland interconnection, said it was difficult to believe that the author's figures were correct. Spinning reserve costs $10/Mw/day, he said.

Dead band in the speed governor tends to produce continuous oscillations of tie-line power at the tie-line natural period of about two seconds, and also a low-frequency oscillation of the system as a whole, said L. K. Kirchmayer, General Electric Co. The magnitude of these frequency swings will only slightly exceed the dead band. Supplementary frequency and tie-line power controls will cut down such oscillations.

The presence of dead band requires a reduction in frequency bias, but not in the power signal of the supplementary tie-line power and frequency controllers, Kirchmayer explained.

120/240V Favored for Residential Distribution

- **Economic analysis shows this voltage is least expensive for 2.4-kva-demand homes; as load increases, 240/480v is cheaper and offers savings up to 20%**
- **Capacitors in series with transformer primaries solve motor-starting problems**

Another contribution was made to the continuing debate on higher secondary voltages for residential loads. H. E. Campbell and H. E. Sinnott, General Electric Co, presented their views and drew immediate fire from R. F. Lawrence and H. E. Lokay, Westinghouse Electric Corp.

Campbell and Sinnott compared costs of 120/240 and 240/480-v 1-phase, and 240/416 and 277/480-v 3-phase. Their conclusions were:

- For homes with 2.4-kva diversified demand—all major appliances—a 120/240-v system is least expensive.
- The 240/480-v system becomes cheaper as load increases, and offers savings approaching 20% at high demands.
- In no case do the higher-voltage 3-phase systems become more economical than 240/480-v.
- The 277/480-v system is slightly less expensive than 240/416-v at all demands.
- It costs more dollars per kva to serve loads on lots with larger frontages. The relation between costs and span lengths is consistent for all demands.
- Use of a 3-kva auto-transformer instead of a 1-kva unit penalizes the higher-voltage systems more at low demands than at high.

Authors Investigated Six Diversified Demands

The authors investigated six average diversified demands per home from 2.4 to 24.0 kva, based on a 34.5-kv substation serving 5,832 homes in 16-home demand groups. Calculations were repeated for 140 and 200-ft secondary spans and 1-kva and 3-kva auto-transformers.

First step was to determine the most economical system for a particular demand, span length, and voltage. Then transformers were spotted in the area under study and a 34.5-kv system laid out. After considering many primary configurations, the authors selected the one with low cost, sectionalizing, and satisfactory voltage regulation.

In his discussion Lawrence took exception to several of their basic assumptions. He pointed out that their cost results were based on an analysis of first, the transformer-secondary combination and, second, the primary circuit. Lawrence contended that a simultaneous economic analysis of transformer, secondary, and primary "insures obtaining the lowest cost systems."

For load densities of 7.2 kva per home and above, the authors included 3-phase meters. Lawrence said this is "considerably more expensive than 1-phase metering," and it is "unfair to assume that every customer on the 3-phase system will have 3-phase service."

Lawrence also disagreed with the inclusion of a 3-kva auto-transformer in the study. He cited the case of two 32,000-kwhr annual usage homes with a 30-min integrated demand of 1 kw for lighting and miscellaneous appliances (EW, Mar. 19, 1956, p 133). "This bears out our belief that the 1-kva auto-transformer would be adequate for nearly all homes."

Lawrence concluded with a plea: "Surely, the electrical industry and the consumer will obtain the economic benefits of higher secondary voltage system. We hope that this study will further assist in arriving at a standard higher secondary voltage and system."

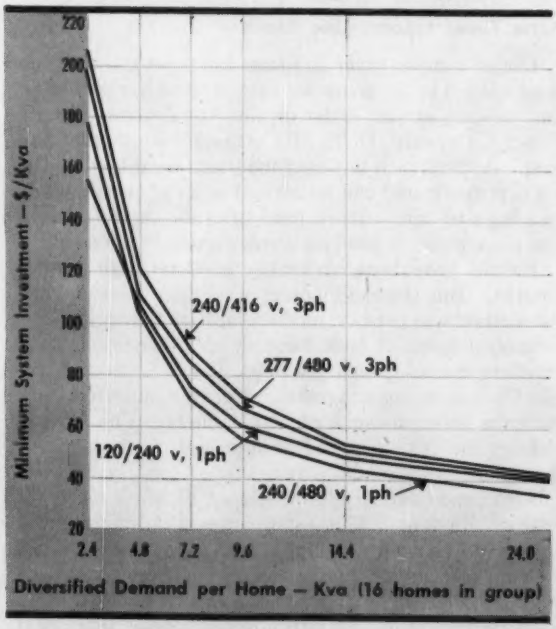
Series Capacitors Solve Starting Problems

Capacitors connected in series with the primaries of distribution transformers economically solve the problem of starting moderately large single-phase motors, reported G. G. Auer, N. M. Neagle, and L. W. Robbins, all of General Electric Co. Neagle presented the paper. They found that 5% impedance in the capacitor offsets transformer regulation and usually avoids ferroresonance. But standard secondary capacitors require protection against voltages caused by secondary faults and this protective equipment must reset itself after the fault is cleared.

In discussion, Auer said failures experienced with indiscriminate installation of series capacitors had necessitated exploration of the requirements.

System Investment Minimum at 120/240v

...for service to homes of 2.4-kva demand; but 240/480 v cuts cost at higher demands



Based on a 34.5-kv substation serving 5,832 homes. Secondary spans are 200 ft; 3-kva auto-transformers are used except for 120/240 v

Survey Shows EE Students' Job Preferences

- **Utility's program seeks to recruit graduate engineers**
- **Aromatic hydrocarbons in insulating oil are classified and described**

Electrical engineering school seniors see their best opportunities for challenging technical work in industries manufacturing electrical equipment, especially those making both electrical and electronic items, according to the 1956 Eta Kappa Nu survey conducted by Stanford Research Institute. The survey was reported to AIEE by M. S. Oldacre, SRI, John D. Ryder, Michigan State University, and S. Reid Warren, Jr., University of Pennsylvania. The last read the report.

Education, manufacturing electronic equipment only, and consulting work in electronic or communications—particularly research, appealed also to the seniors. But they considered technical opportunities "poor" in electric power utilities, process industries, transportation companies, and especially in utilities other than electrical, such as gas and water.

To attract graduate engineers to one of the less favored technical fields, Philadelphia Electric Co has launched a well-integrated program of recruiting, selecting, and training engineering employees. This program was described in a conference paper by G. R. Conover and L. R. Gaty which was presented by Dr. M. S. Viteles, all with the utility.

This program reaches into the secondary schools, where company representatives give talks and invite interested students to visit the company's plants. Company engineering personnel visit engineering schools where, through a series of lectures, they point up the attractions of engineering employment.

The company also offers summer employment to EE students and educators, especially in connection with its network analyzer program.

Sees 400-Kv Supply Coming

What is needed today is more successful "marriage" between the engineer and the position he is expected to fill, said C. H. Linder, General Electric Co. Experience, training, and aptitude vary widely among engineers, and engineering positions have a wide variety of challenges and requirements.

"I cannot agree," he said, "that our manpower problems in engineering work are completely soluble through realignment of the working force. Rather I believe that there are enormous gains to be made in the effectiveness of our effort through more perceptive management of engineering work."

Engineering will not be stymied during the foreseeable future by any lack of energy sources, the AIEE was told by R. E. Wilson, Standard Oil Co (Indiana).

"Our real future energy resource," he said, "is not any substance; it's not so many barrels of oil in the ground, or even the nuclei of so many fissionable atoms. It is science and technology. If we have alert scientists and engineers, and the freedom for them to explore and develop, and we retain the incentives for industry to put them to work, there will be no continuing shortage of any product that people really want and need."

Many large systems will need 400 kv for economical bulk power supply in the next 10 to 15 years, said F. E. Sanford, Commonwealth Associates Inc. Companies installing 150,000-kw generators today, he said, will soon install 300,000-kw generators. To balance these generator sizes, transmission voltages will average 230 or 345 kv, and some companies will go even higher. Basic research and test information must supplement operating records becoming available.

Sanford suggested that a task group or steering committee for extra-high voltage investigation be given specific assignments to define weak and indefinite points in current data and design criteria and to outline further tests, experiments, and developments needed.

Urges Using Talent Abroad

American industry should make use of the excellent research and engineering talent to be found in abundance in Germany, Italy and Austria, urged J. E. Hobson, United Fruit Co.

Hobson proposed that American firms make use of European research and engineering talent without translating it from its home environment. These men, he said, work best in their own laboratories, and Europeans generally are angered at any effort to entice their scientists abroad. Employing them at home on a contractual basis is most congenial to all concerned and would also afford American industry the opportunity to take advantage of the excess industrial laboratory capacity in Italy and Austria, he said.

Insulating oils contain from 10 to 45% aromatic hydrocarbons depending on the base and the extent of refining, said Drs. J. L. Jezl, A. P. Stuart, and E. S. Ross, all of Sun Oil Co. These aromatics tend to lay down sludge and add color during oxidation, and show little response to inhibitors. They fall into four type groups:

1. Mononuclear aromatics are readily oxidized and are antagonistic to both natural and synthetic inhibitors.

2. Dinuclear aromatics in pure state resist oxidation. In blends they tend to form inhibitors during oxidation which are lost when mononuclear aromatics are present.

3. Trinuclear aromatics resist oxidation more than dinuclear but respond poorly to added inhibitors. In uninhibited blends they show decided natural inhibition which is decreased by mononuclear aromatics.

4. Polynuclear aromatics, while present in small quantities, possess good inhibition but contribute to color and sludging.

Non-hydrocarbons in oil include nitrogen, sulfur, and oxygen compounds, they continued. Best oil stability is attained after nitrogen compounds have been removed but when most of the aromatics and sulfur compounds remain. But the refiner must remove most of these to get an oil suitable for synthetic inhibiting.

In discussion, G. H. von Fuchs, Doble Engineering Co, criticized placing too much emphasis on oxidation rates and ignoring oxidation products.

Industrial Reliability Gains Reported

- D-c Relays, Ungrounded Systems Urged
- Heating, Cooling Devices Evaluated

Air-break contactors adjustable for specific operating conditions reduce critical motor outages caused by momentary system disturbances, a session on the use of power in industrial applications was told. Coils operated on rectified ac, according to S. R. Durand and Thad Bellinger, Allis-Chalmers, can be designed to hold in at voltages down to 35% normal, where ac devices which drop out slightly below 85% voltage to disconnect motors within two or three cycles.

An adjustable resistor in the dc contactor circuit delays opening 0.1 to 0.5 sec to allow breakers to clear severe faults and switching surges without dropping motor loads. But this type of relay should be used only on the most critical motors in a continuous process plant, as it may not be possible to re-accelerate many motors simultaneously after a fault.

Ungrounded systems of 600 v and below have an advantage in service continuity, said J. A. Gienger, Eastman Kodak Co. There are, he said, practical methods for tracing accidental grounds with power on, which can be used in combination with systematic detecting and clearing. One plant's experience with 92 separate 240 and 480-v ungrounded systems indicates relatively heavy arcing at accidental grounds in grounded systems is a greater potential hazard than abnormal voltages in a properly operated ungrounded system.

Voltage to ground was considered a possible factor in 42 of 192 grounds detected, traced, and cleared in a 5-year period representing 90,000 connected motor years. Under dry conditions, only 8% of the total motor winding failures involved arcing to ground. In a 240-v resistance grounded system an accidental ground beyond the motor protective device can cause a ground current sufficient to drop fairly large motors.

Seek to Quiet Home Appliances

Various aspects of electric space heating and cooling, the problems and design factors in minimizing noise in motor-driven home appliances, high-frequency power sources, and high-frequency fluorescent lighting were the primary subjects in domestic and commercial application sessions.

J. C. Beckett, Wesix Electric Heater Co, described a motor-operated, relatively noiseless switch for changing voltage on space heating systems.

C. W. Bary, Philadelphia Electric Co, discussed at length the economic effect of heat pumps on electric utilities. Facets were: gearing facilities to meet the added load, developing optimum-efficiency pumps, and setting up billing methods that take into consideration factors inherent in heat pump loads.

Single-phase service has it all over three-phase service for residential air conditioning, according to a paper by A. S. Anderson and C. Hutchinson, both of Ebasco Services.

Noise in home appliances was treated in a paper by E. R. Cunningham and G. L. Wolfert, both General Electric Co.

The development and application of high frequency fluorescent lighting was discussed by J. H. Campbell and Q. D. Dobras of GE. Its use has stimulated interest in h-f power sources, according to V. C. Geckler of General Motors Corp.

New Device Stops Heart Fibrillation from Electric Shock

Two machines, built for defibrillating the heart, have been successful on 12 persons, reported Dr. W. B. Kouwenhoven and Dr. W. R. Milnor, John Hopkins University. They noted that work is progressing in field methods and equipment for defibrillating.

In electric shock cases, currents from 0.1 to 2 or 3 amp destroy the rhythm of the heart, throwing it into the twitching state known as ventricular fibrillation. Circulation stops, the patient gasps for breath for about 1 min, then respiration stops for lack of oxygen in the blood going to the brain. Apparently the respiratory center and nerves are affected by the shock only indirectly through anoxia.

The only sure way of halting fibrilliation is to send sufficient current through the heart to contract it and bring its twitching muscle fibers to rest, said Kouwenhoven. When the circuit is opened, the heart resumes normal beating unless fibrillation has weakened it.

Currents from a few to 50 ma usually have no serious results, the authors said. Six amp and up hold the heart contracted, but it generally resumes normal beating when the circuit is broken.

Dr R. W. Chestnut, Jr., shows defibrillator electrode position on Dr Kouwenhoven's chest for E. A. Hoxie and R. L. Lloyd

Progress
in
turbine-
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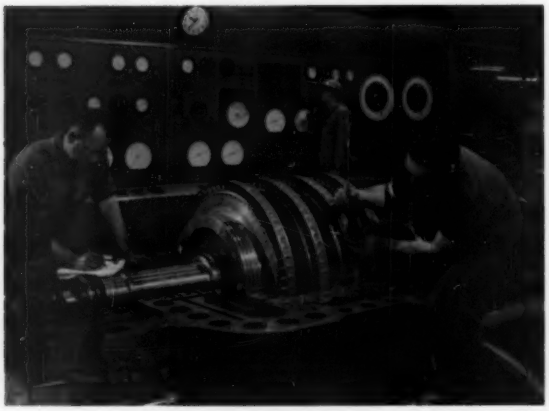
Full-size turbine and generator parts and a great variety of development setups can be tested and evaluated for service performance at General Electric's Turbine-Generator Development Laboratory. Especially designed testing equipment—some described briefly on these pages—provides answers and engineering data that could not possibly be obtained before. This Laboratory, now in full operation, is of vital importance to all large steam turbine-generator development engineering. It supplements the Large Steam Turbine-Generator Department's Materials and Processes, and Air Test Laboratories.



INCREASE TURBINE EFFICIENCIES—High-pressure test turbine provides precise operating data on new bucket, nozzle, rotor and shell designs, leading to higher efficiencies.

INCREASE GENERATOR RATINGS—To increase generator ratings without great physical size increase, more effective dissipation of heat must be provided by improvements in the fans and the cooling systems. Prototypes of fans designed to cool higher-rated generators are run in this full-scale fan test setup. A new fan is being tested here for a 300,000-kw unit. Pressure-volume characteristics and efficiency can be determined—information vitally needed for good fan design.

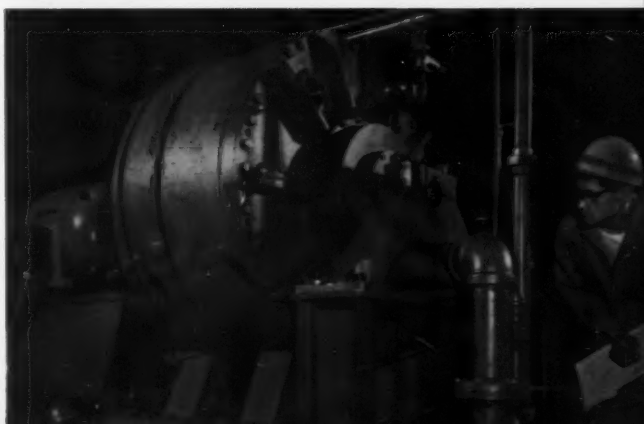
HIGH-SPEED BURST PIT shown on preceding page spins turbine and generator rotor cross sections and reveals fracture characteristics and effects of physical configurations.

DETERMINE TURBINE EFFICIENCY—Accurate determination of overall efficiencies of new turbine designs is one of the most important considerations in building future turbines. And an inherent part of this problem is the development of more accurate flow nozzles. Here, the calibration of a water flow nozzle is being checked, using large, highly accurate scales and weigh tanks.

IMPROVE THRUST BEARING DEPENDABILITY—Thrust bearings of larger capacity are required for the larger turbines being designed. The machine shown here is used to test new thrust bearing designs. Operating at 1800 or 3600-rpm, it can impose loads up to 450,000 lbs—equivalent to the weight of the Statue of Liberty. It is also used to measure oil and babbit temperatures, and oil film pressures and thicknesses under conditions tougher than those encountered in actual operation. This machine has proved the dependability of General Electric thrust bearings.

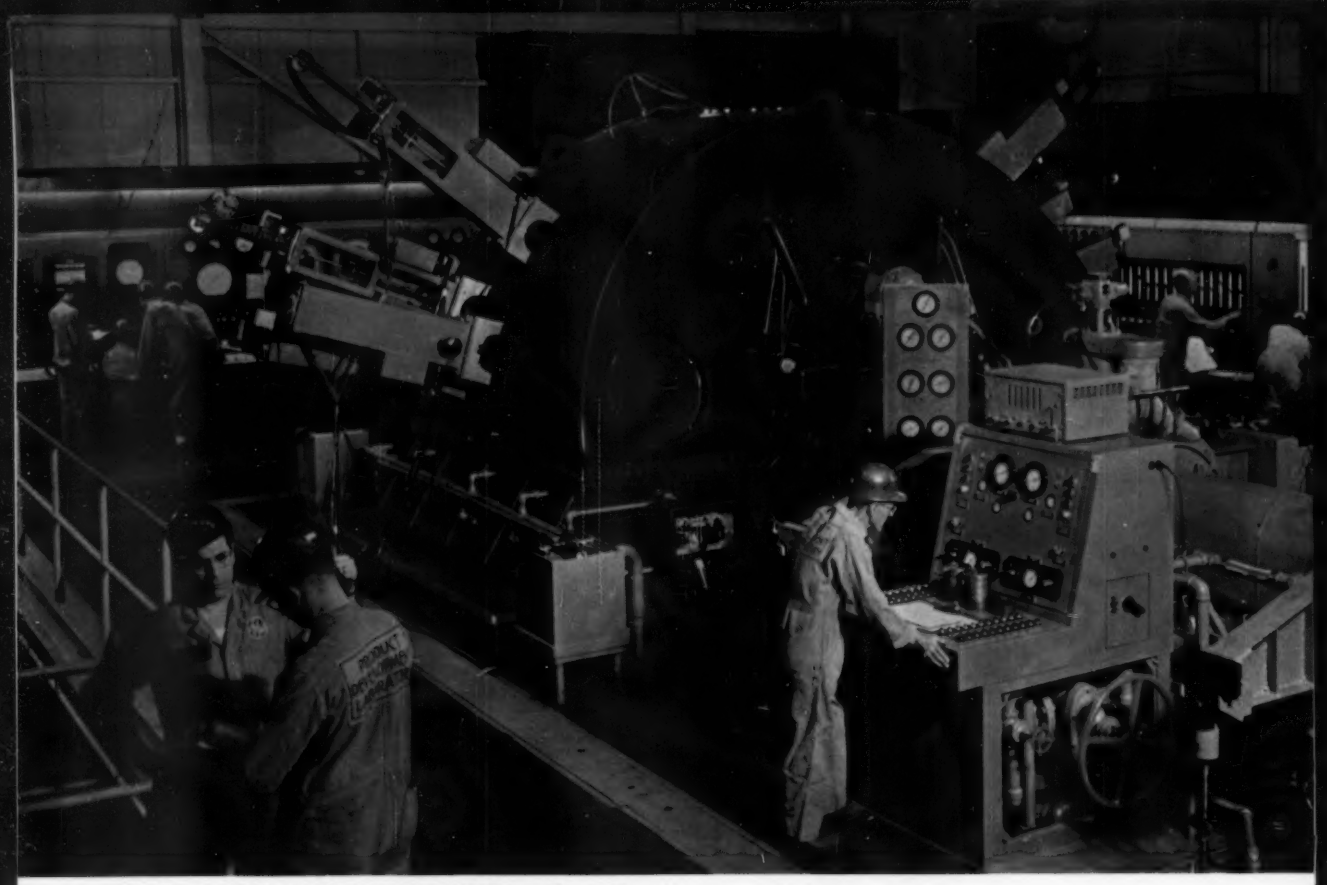
INCREASE GENERATOR INSULATION LIFE—Insulation is one of the most important factors affecting the life of a generator. That is why General Electric conducts extensive research aimed at prolonging insulation life. On this special "girth crack" test setup, a generator stator bar is subjected to simulated operating conditions. Thermal expansion is duplicated and ten years of operating cycles are condensed into four months of testing. Engineers can study and design new insulation systems that will reduce operating difficulties.

SIMPLIFY HYDROGEN SYSTEM—With this test set up General Electric engineers are working to develop a new shaft seal to permit the application of the continuous scavenging system on all generators regardless of size. This system requires no vacuum treatment of the oil.



Progress Is Our Most Important Product

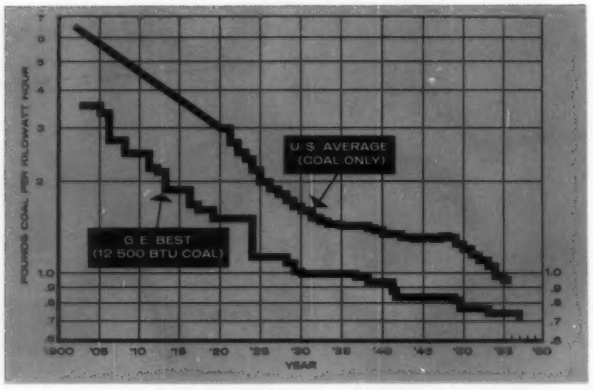
GENERAL ELECTRIC



FULL-SCALE, LOW-PRESSURE TEST TURBINE enables G-E engineers to evaluate new design concepts and to study turbine steam paths under actual operating conditions.

IN GENERAL ELECTRIC'S DEVELOPMENT LAB

Low-pressure turbines get critical study



STATION COAL RATE chart shows rapid progress in electrical equipment efficiency. U. S. average is from FPC reports, compared with station coal rates for G.E.'s most efficient units.

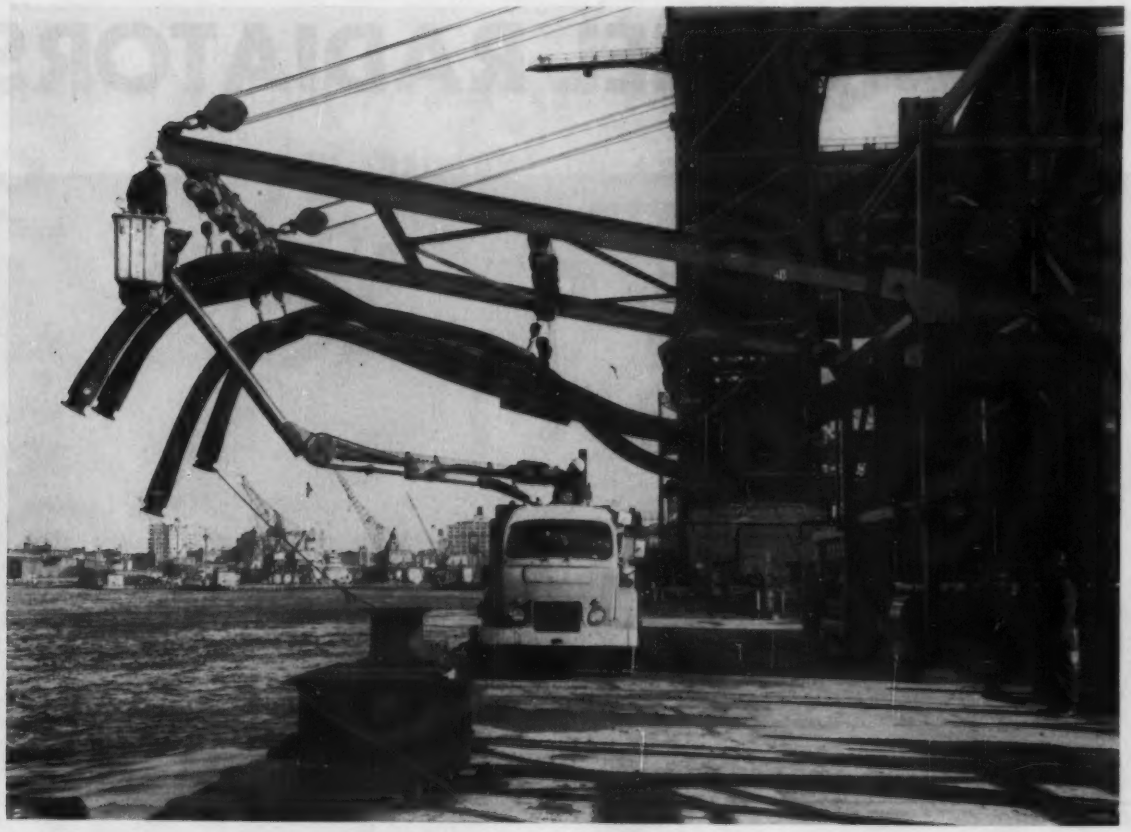
As the rating of steam turbines has continued to increase, a greater proportion of a unit's output is being produced by the low-pressure section. In addition, the advent of nuclear power has further established the importance of efficient use of the energy in this region.

The solution to problems in the low-pressure section can be evaluated in the Turbine-Generator Development Laboratory's full scale, low-pressure test turbine. Here the largest 3600-rpm turbine parts built by General Electric can be run under actual operation conditions.

With facilities like these, G-E engineers can solve power generation problems before they occur—so that tomorrow's turbine-generators will be even more efficient. For more information write for bulletin GED-2554, Large Steam Turbine-Generator Dept. General Electric Co., Schenectady 5, N.Y. 254-47

Progress Is Our Most Important Product

GENERAL ELECTRIC



GENERATION—Operation

Boom Cable Repair Speeded by 'Skylift' Truck

Everyone knows how a "Skylift" truck is employed in the repair of overhead lines. But construction forces of Consolidated Edison Co of New York recently put it to another use which saved time and money.

While preparing for unloading an oil tanker at the 11-million-gal storage facilities adjacent to the Hudson Avenue station on the East River, plant personnel discovered that the booms supporting the hoses for transferring oil were in need of cable repair.

These booms are 35 ft long and pivot about pins 17 ft above the dock. Eight 1-ton electrical hoists are arranged in two rows, one row at the middle of the boom and the other at the end to support the flexible hoses. When the boom is in a horizontal position, the outer hoists extend 13 ft out from the dock.

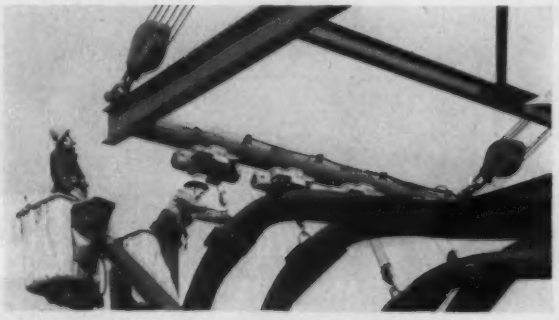
As the ocean-going oil tanker, Esso Richmond, was due in the next few days, the time was too short for building a scaffold. Doing the job in the conventional way would have involved building two scaffolds about 50 ft high. Such building usually takes about 48 man-days of work in wintry weather.

When use of the "Skylift" was suggested, C. E. Holmes, assistant superintendent of the construction group, considered for a moment and replied:

"There's nothing like trying."

The "Skylift" was brought up and used as a flexible work platform, the construction men working from its twin buckets extended over the river. In this way, five men completed the job in two days. Its completion permitted the tanker to unload on schedule.

(More How To on page 96)



NEW PANEL RADIATORS..

less maintenance, longer life

..on General Electric vault-type network transformers mean maintenance savings for Western Massachusetts Electric Company

Western Massachusetts Electric Company recently installed the first units of a new type of General Electric network transformer for vault service. The new transformers feature panel radiators, which G.E. introduced in 1954 for subway service. The new radiators offer maintenance savings for utilities everywhere.

Fewer Entrances Increase Reliability

Now standard on all ratings for vault service, the new radiators greatly increase transformer reliability because there is less chance for leaks. There are only eight entrances into the transformer-tank wall compared with 56 on the 500-kva tubular-radiator design. The radiators minimize danger from corrosion because they discourage the accumulation of dirt, moisture, and all types of corrosive elements. Radiator edges are narrow and sides are smooth, vertical planes.

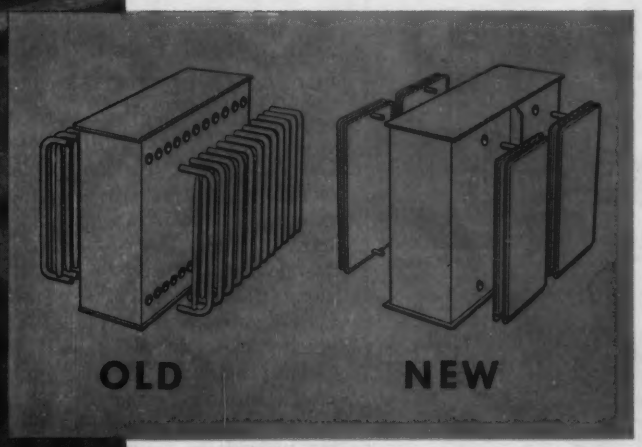
Panels Simplify Cleaning, Repainting

With smooth panels, it's a cinch to clean or repaint the radiators. A few sweeps with a long-handled brush remove the dirt. And repainting is almost as easy since the radiators are flat panels instead of tubes.

HELP FOR YOU

For help in solving your network problems and for complete information on the advantages of G-E network transformers with new panel radiators, contact your local G-E Apparatus Sales Office—or write to General Electric Company, Schenectady 5, N. Y. 435-13

LIVE BETTER ELECTRICALLY



CONVENTIONAL-DESIGN radiators (left) have many tank entrances. New panel radiators require only eight entrances into tank. This greatly reduces chance for leaks, increasing reliability.

NEW PANEL radiators are easy to clean. Workman's flashlight shows space between panels, and between panels and transformer. Vertical, smooth surfaces retard dirt collection.

Progress Is Our Most Important Product

GENERAL ELECTRIC

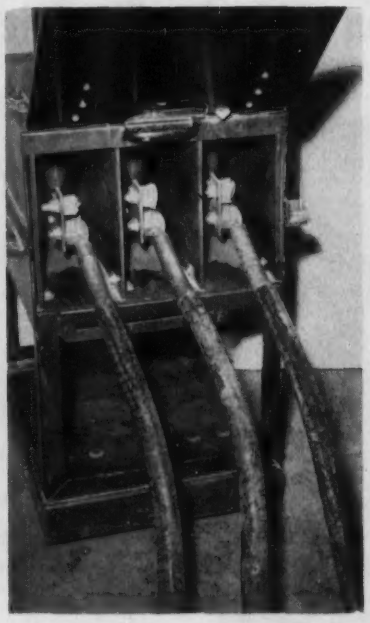
SUBSTATION—Maintenance

Protects Men, Equipment During Phase-Out

GLEN SIMMONS, Indiana & Michigan Electric Co, Muncie, Ind.

When a dummy draw-out breaker is used to phase out portable transformer cables that carry load during disconnection of a station transformer bank for any purpose, an 18x12x¼-in. micarta barrier, fastened with 5-in. strap hinges over the dummy breaker terminal compartments, safeguards Indiana & Michigan Electric Co personnel and equipment.

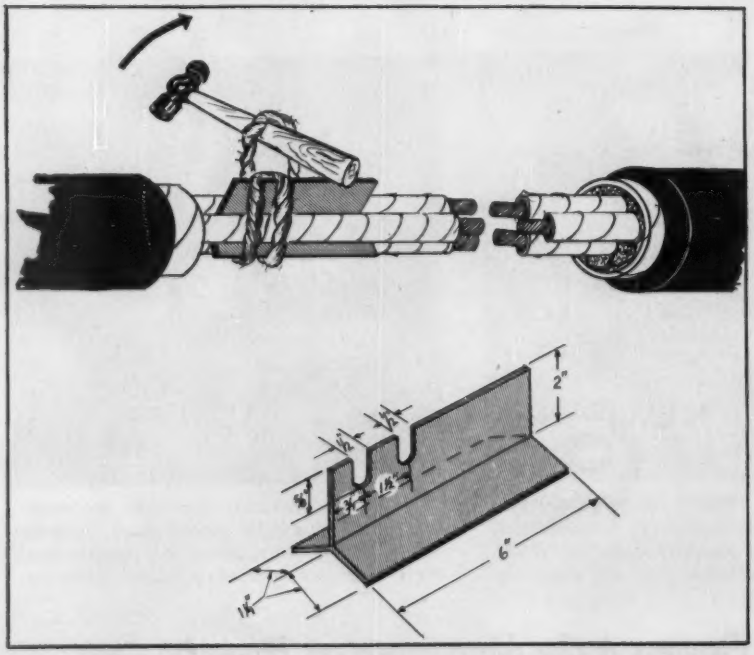
Its installation takes about 1½ man-hours.



Barrier Prevents Contact

With the metal-clad, draw-out breaker used for this purpose, precautions had to be taken against accidental contact with the portable substation cable terminals which have metal sleeves or ferrules about 6-in. long. Connected to the dummy breaker, these sleeves extend beyond the barrier, exposing the breaker operator to 4 kv if the breaker crank slips or drops during opening and closing of the breaker.

The micarta barrier prevents such accidental contact which would not only jeopardize the life of the operator, but possibly cause a short circuit and severe damage to the equipment.



THREE STEEL VANES, welded together, form cable rotator. The device, inserted in crotch and rotated, twists the conductor into phase position for splicing and has become standard splicers' equipment at East Bay Division

DISTRIBUTION—Operation

Splicer Tool Twists Cable For Matching Phases

An underground cable rotator, designed by H. C. Squires, Pacific Gas & Electric Co cable splicer, facilitates twisting of 3-conductor cables in matching phases for splicing. The rotator has three ⅛-in. thick steel vanes welded together along their longitudinal edges at 120-deg angles. The widest vane is notched as in the illustration.

The rotator is inserted in the crotch formed by the spread conductors with the notched end pointing toward the crotch. A loop of rope, hooked into the two notches, is wound around the rotator. A hammer handle, or equivalent, inserted through the loop and rotated, provides leverage for twisting the conductors into position. The rotator is standard equipment for cable splicers at PG&E's East Bay Division.

WHITEWAYS | DOWNTOWN | PRIMARY TRAFFIC | SECONDARY TRAFFIC | RESIDENTIAL

FILAMENT LUMINAIRES, the type in greatest use today, are lowest in initial cost, highly flexible, and offer good color quality.

MERCURY LUMINAIRES, often used to attain the higher illumination levels, are characterized by long lamp life, high lamp efficiency.

FLUORESCENT LUMINAIRES offer superior visibility, fine color, low glare, long lamp life, low maintenance, and low power consumption.

General Electric offers all 3 luminaire types to assure best lighting for every street

In attacking your street lighting problems, you naturally want all the available tools to select from. Such choice is automatic when you work with General Electric, because G. E. offers complete luminaire lines (and years of experience in applying each) for all three light sources: filament, fluorescent, and mercury.

This means two important things to you: First, no matter what type of street, or what special conditions exist, your General Electric representative can draw on these years of experience in advising you. Second, the advice you get will be impartial—based on engineering and economic facts—since G. E., as a full-line manufacturer, has no reason to favor one type of lighting over another.

VISION-ENGINEERED SYSTEMS

Let G. E. help your street lighting program on a ***vision-engineered system*** basis. On every lighting project, regardless of size or type, General Electric offers you:

PROJECT RESPONSIBILITY—one source of supply for ***all*** your street lighting needs, including complete control and auxiliary equipment as well as luminaires.

COMPLETE ENGINEERING ASSISTANCE—expert start-to-finish aid from field and factory lighting specialists.

RESEARCH LEADERSHIP—the industry's newest and most complete laboratory, development, and proving facilities are located at G.E.'s "Outdoor Lighting Center of the World" in Hendersonville, N. C.

Get the full ***vision-engineered system*** story from your nearest Apparatus Sales Office or authorized agent! General Electric Co., Schenectady, N.Y.

LIVE BETTER ELECTRICALLY

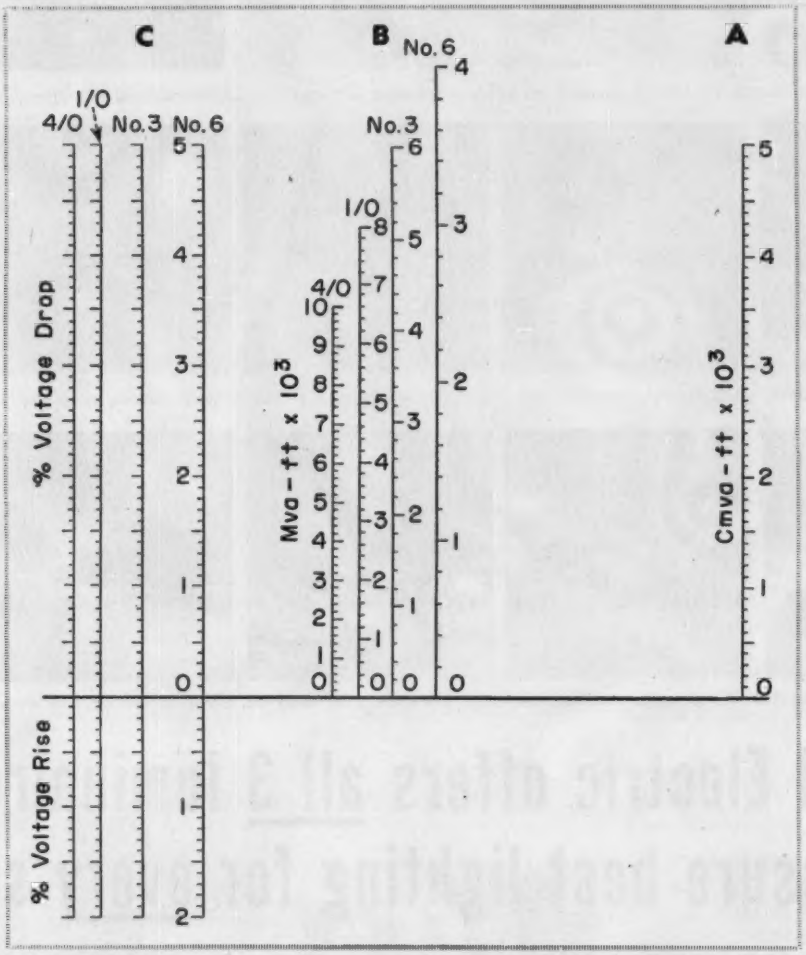
452-167

VISION-ENGINEERED STREET LIGHTING SYSTEMS

GENERAL ELECTRIC

Design Nomogram to Solve Voltage Problems

RAYMOND A. DEWBERRY, Electrical Engineer, Peter Loftus Corp, Pittsburgh, Pa.



Design method is presented for a nomogram as an aid in solving voltage problems, especially on lines where shunt capacitors are used.

Accompanying chart is an example of the design. It is constructed on a 2,400/4,160-v base using 16-in. equivalent spacing, for No. 6, 3, 1/0 and 4/0 open wire conductors.

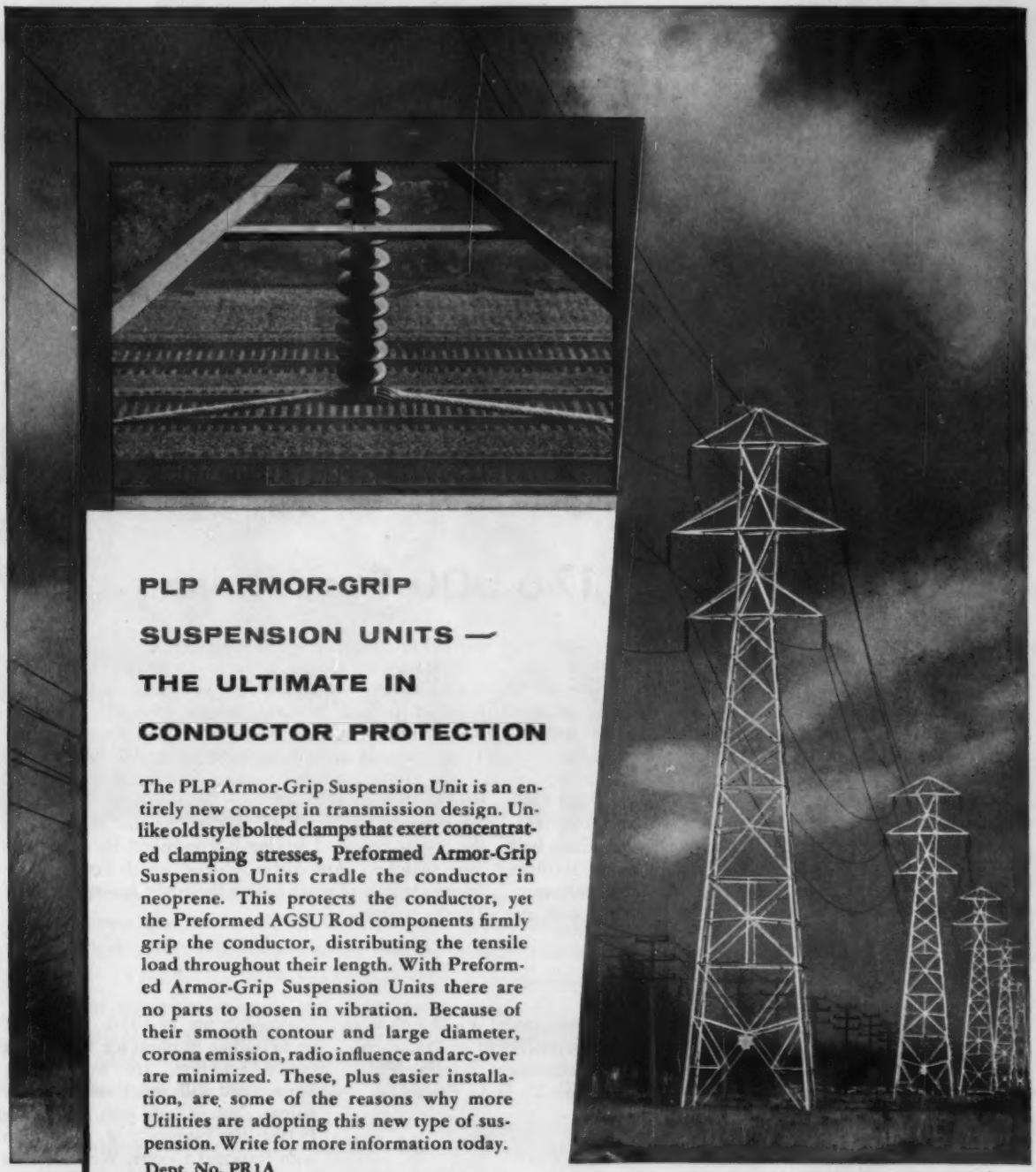
To use this chart for a distribution line, or a section of a line, a straight edge is placed at Cmva-ft value on scale A and Mva-ft value on scale B. Percent voltage drop (or rise) is read on scale C.

Same design method may be used for other voltage systems. Data required are the percent drop (or rise) per Ckva-ft and kva-ft for a specific system and wire size. Cmva-ft and Mva-ft are used to keep figures to a low value.

To construct a chart, scale A is graduated conveniently so that 1-in. equals 1,000 Cmva-ft. Then scales B and C are spaced so that the distances from B to C and from A to B have the ratio of the percent rise per 1,000 Cmva-ft expressed as a fraction. For example, if the percent voltage rise of No. 3 wire per 1,000 Cmva-ft is 0.7, then BC/AB = 7/10, where BC and AB represent the horizontal distances between the three scales.

Scale C will have the same numerical divisions as scale A, divided by 1,000 to read in Cmva-ft.

A simple way to graduate scale B is to connect by straight edge any point on scale C and the origin on scale A. Then calculate the required Mva-ft to give the percent drop shown on scale C and plot this value on scale B where it is crossed by the straight edge. Scale B will be uniformly graduated so one point thus obtained is all that is needed to select the proper scale to mark off the calibration.



PLP ARMOR-GRIP SUSPENSION UNITS — THE ULTIMATE IN CONDUCTOR PROTECTION

The PLP Armor-Grip Suspension Unit is an entirely new concept in transmission design. Unlike old style bolted clamps that exert concentrated clamping stresses, Preformed Armor-Grip Suspension Units cradle the conductor in neoprene. This protects the conductor, yet the Preformed AGSU Rod components firmly grip the conductor, distributing the tensile load throughout their length. With Preformed Armor-Grip Suspension Units there are no parts to loosen in vibration. Because of their smooth contour and large diameter, corona emission, radio influence and arc-over are minimized. These, plus easier installation, are some of the reasons why more Utilities are adopting this new type of suspension. Write for more information today.

Dept. No. PR1A

PX-79

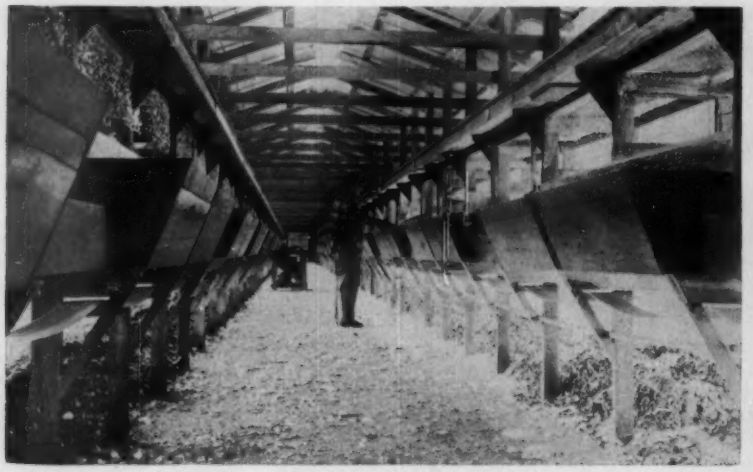
PLP Armor-Grip Suspension Units support these 132 KV Cleveland Electric Illuminating Company lines.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

Telephone: Cleveland EXpress 1-3571

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.



Endless Belts Carry Hens' Output to . . .

A Pair of Buffers as . . .

Conveyors Keep 1,176,000 Eggs Rolling

Electrified egg-handling and feeding have eliminated much of the labor on a 5,000-hen poultry ranch in California. Electrically driven conveyor belts allow each of two handlers to crate an average of 3-4 cases of clean eggs per hour. Annual "production" is 236 eggs per hen, for a total exceeding 98,000 dozen eggs per year.

The conveyor system is on the ranch of John Tennyson, near Petaluma. It consists of 5-in. wide flat endless belts which travel adjacent to the nests along both sides of the center alley in the laying house. Each belt is driven at 7.5 ft per min by a small motor through reduction gears. Eggs laid in conventional roll-away nests come to rest on the surface of the belts and are carried to collecting stations for crating.

Breakage on the conveyor is not greater than under hand-gathering methods. A motor-driven buffer is installed at each collecting station to polish the occasional soiled egg. The conveyor-belt saves rancher Tennyson and his wife at least an hour's labor daily.

The entire poultry operation is electrified. To add light in winter and stablize the feeding day at 16 hours, 50-w lamps are installed in each of the 36 cages in the laying house. Lighting is controlled by automatic time switches. Automatic feeders, which keep a continuous supply of mash before the birds, are operated by 2½-hp motors.

Commerce Dep't Issues Appliance Bulletin

The U. S. Department of Commerce has issued a bulletin entitled, "Basic Information Sources on Electrical and Gas Appliances, BSB-20." The 8-page document is a compilation of reference material and sources of information relating to the electrical and gas appliance industries.

Information sources are broken down into five categories: (1) Government publications, (2) Non-Government publications, (3) Trade papers and magazines, (4) Directories, and (5) Trade associations and professional societies.

It may be ordered from any Commerce Department Field Office or from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 25¢.

Telecast Gets '57 LBE Program Off the Ground

Some 35,000 members of the industry in more than 60 cities watched the 1957 Live Better . . . Electrically program get off the ground via a nation-wide closed circuit telecast on January 30th.

The TV show, starring John Daly and Giselle MacKenzie, marked LBE's first birthday. It featured an entertaining presentation of the accomplishments in 1956, then went on to outline its plans for 1957. This year's activities are to include: Spring and fall retail selling compaigns, integrated with HOUSEPOWER's "surges"; a full tie-in with National Electric Week; a consumer idea book; and a new motion picture to follow up last year's highly successful "Meet Mrs. Swenson."

Finally, the show urged full participation by all segments of the industry—utilities, manufacturers, contractors, bankers, architects, realtors, etc—to make the '57 LBE activities a powerful selling force and industry coordinator.

(*More Selling on page* 102)

"I'll never replace

VICTOR SUSPENSIONS...

I just won't live that long!"

Men who purchase insulators are enthusiastic about the service records of VICTOR Suspensions. That's because VICTOR Suspensions are laboratory designed, manufactured under rigid quality controls and tested with the industry's most modern equipment.

Take the No. 900 Insulator shown above, for example. It has rugged, rounded corrugations for maximum strength and resistance to impact. Cap and ball bolt are thick, husky and galvanized to withstand severe service. Scientifically fitted glaze gives added strength and added protection against contamination. Each insulator is proof-tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover tests. When you buy VICTOR, you just can't buy better suspensions!

New . . . . . .

VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for *your* copy.

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC.
VICTOR, N. Y.

What Makes RT&E Transformers Better?

EXCLUSIVE WOUND-CORE CONSTRUCTION

Low Iron Losses—Low Exciting Currents

A method developed and used exclusively by RT&E forms the transformer core of non-aging, high permeability, cold-reduced, silicon steel strip.

This method produces RT&E's light, compact core, combining the best core features — low losses, low exciting currents, permanent characteristics and quiet operation.

Core is of uniform thickness throughout its entire magnetic length.
Single turn laminations are staggered butt-jointed and lap secured on either side
Free of joint bulges

RT&E Transformers are submitted to the most exacting tests, to approximate 150% of NEMA full wave withstand values. They are backed by a five year guarantee.

RT&E CORPORATION
WAUKESHA, WISCONSIN

EXCLUSIVE WOUND-CORE CONSTRUCTION—Another reason why **RT&E** is better!

SELLING (*Continued*)

HEATING AND COOLING

EEI Publishes Heat Pump Data Sheets

Electric Space Heating & Air Conditioning Committee of EEI has issued Publication No. 56-12, "Heat Pump Data Sheets on Residential and Commercial Installations." Some 56 data forms broken down by heat source and heat sink and as between residential and commercial installations and by climatic zones are given. This data may be useful in comparing seasonal consumption, load factors, etc with predicted data for heat pumps to be installed under similar conditions.

Price to member companies is $2.00; to non-members, $3.00; abroad, $3.00. Write Electric Space Heating & Air Conditioning Committee at Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

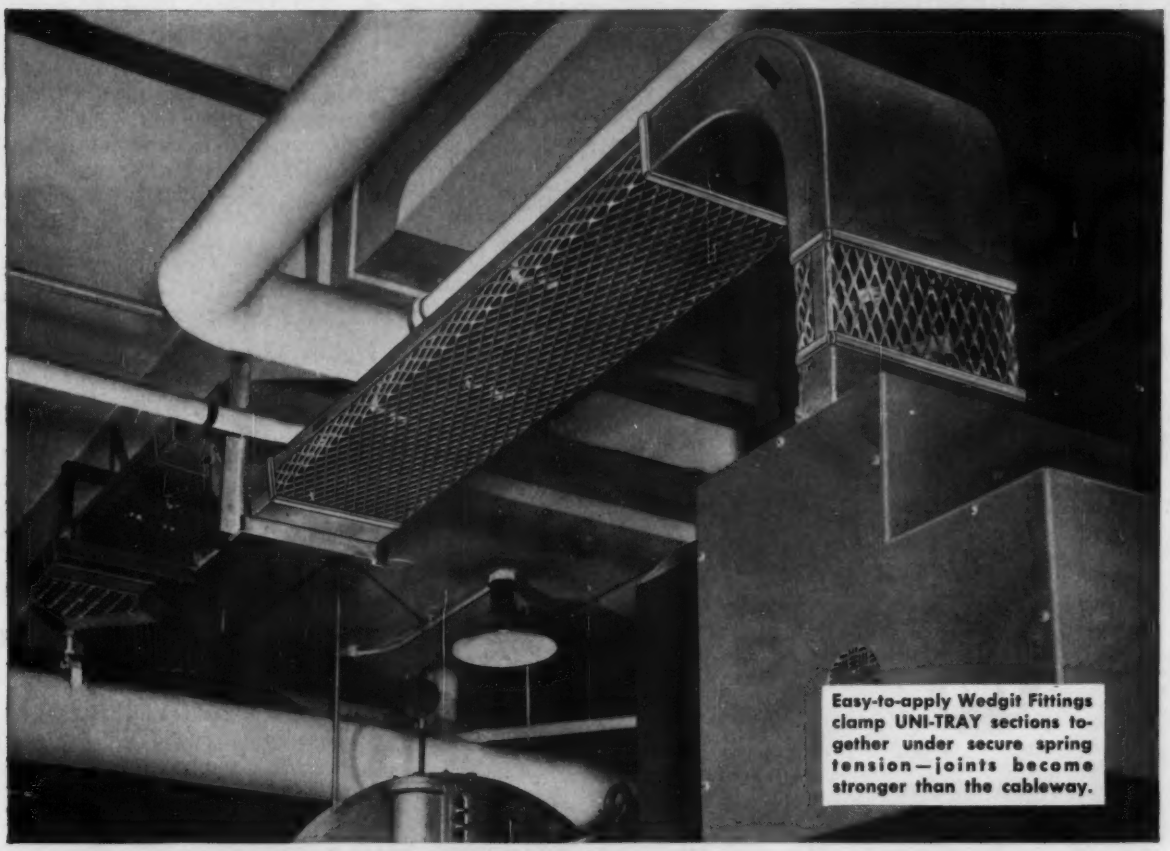
Power Use Varies Widely in Air-Conditioned Homes

A recent study of 30 comparable homes reveals that "Wide variations in power consumption for residential air conditioning do occur even where all differences of heat gain and equipment performance are eliminated or are reduced to a minimum.

R. A. Gonzalez, staff assistant to sales vice president, Airtemp Division, Chrysler Corp, told American Society of Refrigerating Engineers semi-annual meeting that the study brought these conclusions:

- There are wide variations in power used for air conditioning just as there are variations in residential usage for other purposes in identical homes. In terms of high consumers, the low consumers used less than one half as much power for cooling identical houses.
- High power consumers in non-air conditioning months are not always the high users of power for air conditioning.
- Many homeowners exercise

(*Continued on page* 104)



Easy-to-apply Wedgit Fittings clamp UNI-TRAY sections together under secure spring tension—joints become stronger than the cableway.

Lower installation costs with an improved

UNI-TRAY Cable-way System

With Delta-Star's UNI-TRAY Cable-ways you reduce installation time up to 40%—substantially cutting cableway costs. Simply position the trays, then tap in Wedgit Fittings to connect sections. No bolts, pins or hinges to fit or tighten. UNI-TRAY Cable-way joints are assembled four times faster than with other type fittings.

Strong, lightweight expanded metal sections provide ventilation necessary for high current rating of cables—prevent collection of water and dirt. Continuous Wedgit contact areas provide excellent electrical contact for ground currents.

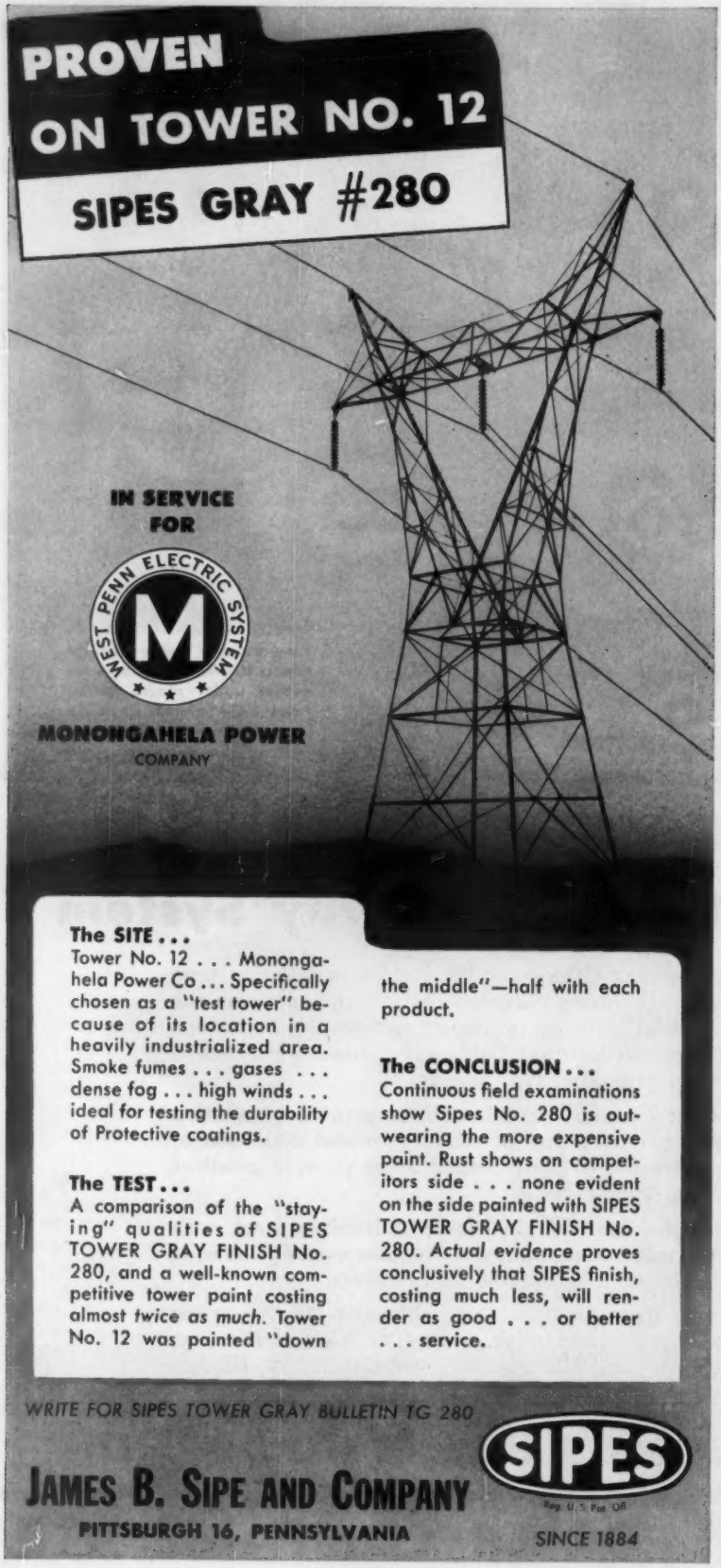
UNI-TRAY sections are available in hot-dip galvanized steel, with aluminum Wedgit fittings. Aluminum sections also available. A wide variety of shapes and sizes meet specific requirements.

For complete facts, write for UNI-TRAY Publication No. 68—or see your nearby Delta-Star representative. *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.*

HKP

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.


PROVEN
ON TOWER NO. 12
SIPES GRAY #280
IN SERVICE FOR
WEST PENN ELECTRIC SYSTEM
MONONGAHELA POWER COMPANY
The SITE . . .
Tower No. 12 . . . Monongahela Power Co . . . Specifically chosen as a "test tower" because of its location in a heavily industrialized area. Smoke fumes . . . gases . . . dense fog . . . high winds . . . ideal for testing the durability of Protective coatings.
The TEST . . .
A comparison of the "staying" qualities of SIPES TOWER GRAY FINISH No. 280, and a well-known competitive tower paint costing almost twice as much. Tower No. 12 was painted "down the middle"—half with each product.
The CONCLUSION . . .
Continuous field examinations show Sipes No. 280 is outwearing the more expensive paint. Rust shows on competitors side . . . none evident on the side painted with SIPES TOWER GRAY FINISH No. 280. Actual evidence proves conclusively that SIPES finish, costing much less, will render as good . . . or better . . . service.
WRITE FOR SIPES TOWER GRAY BULLETIN TG 280
JAMES B. SIPE AND COMPANY
PITTSBURGH 16, PENNSYLVANIA
SIPES
Reg. U. S. Pat. Off.
SINCE 1884

SELLING (*Continued*)

considerable manual selection of equipment operating time. There is no evidence that this is motivated by reasons of economy any more than by personal preference.

- Variations in power use due to homeowner operating preferences are so great that field tests for equipment differences and construction effects can't yield conclusive answers.

NEMA Endorses TV Spots

An effective and entertaining series of six 1-minute television spots based on the color sound slide film, "Heat Your Home Electrically" is now available. The film was produced by the Electric House Heating Section of the NEMA.

The spots can be obtained in either black and white or color. Standard spots carry the Live Better. . . . Electrically theme; tailored spots are available that offer a sponsor an opportunity to insert his name in the copy.

The TV spots are endorsed by the NEMA Electric House Heating Section and are available from Continental Productions Corp, 539 Vine Street, Chattanooga, Tenn.

COMPETITOR'S CORNER

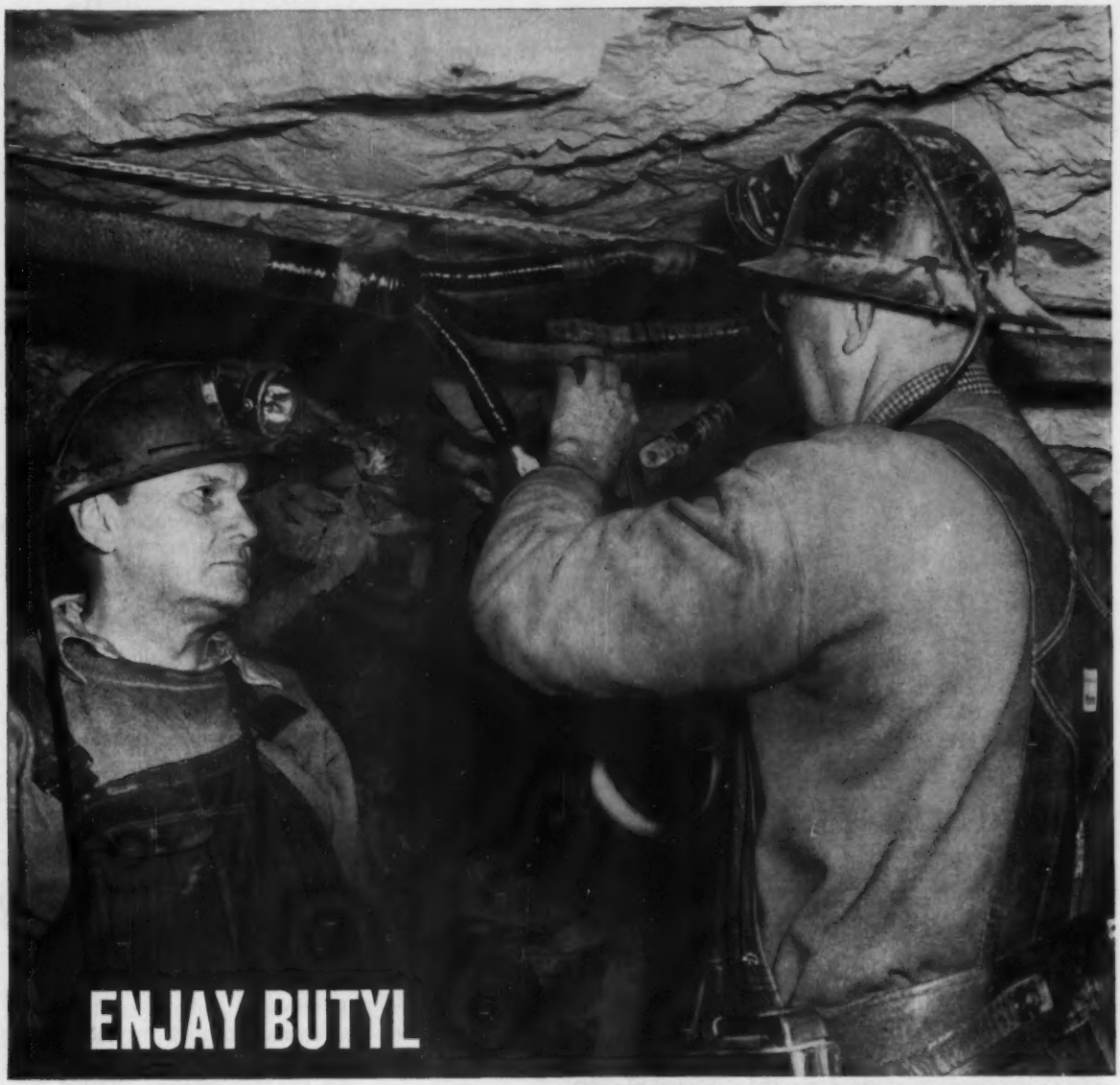
Plan Gas A.C. Test in '57

Alwin B. Newton, vice president of Coleman Co, Wichita, Kan., recently told the American Society of Mechanical Engineers that his company will test 150 gas-fueled home air conditioning units in the summer of 1957, according to a report in *Gas Age*. The units are of a three-ton capacity.

Newton goes on to say that Coleman is very close to a successful, merchandiseable unit which, although it may have a higher installation cost, will have an operating cost which will probably average two thirds that of equivalent electrical units.

Twenty one gas air conditioning units were tested in 1954, and 41 in 1955, with a production trial run of 250 units made in 1956.

(More Selling on page 106)



electrical wonder rubber OFFERS TRIPLE VALUE

Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In laboratory tests, and a wide variety of applications, no other rubber has matched Enjay Butyl's ability to resist ozone and corona, impact and abrasion, moisture and weathering . . . properties that make Enjay Butyl-made products *outstanding* performers.

Underground service cables, transformer housings, high-voltage industrial cables . . . in these, and many other electrical applications, Enjay Butyl outperforms and out-lasts *all other* types of rubber, synthetic *or* natural. *Low-in-cost* and *immediately available*, this truly wonder rubber may well be able to cut costs and improve performance in *your* products. For further information, and for expert technical assistance, contact the Enjay Company.

ENJAY

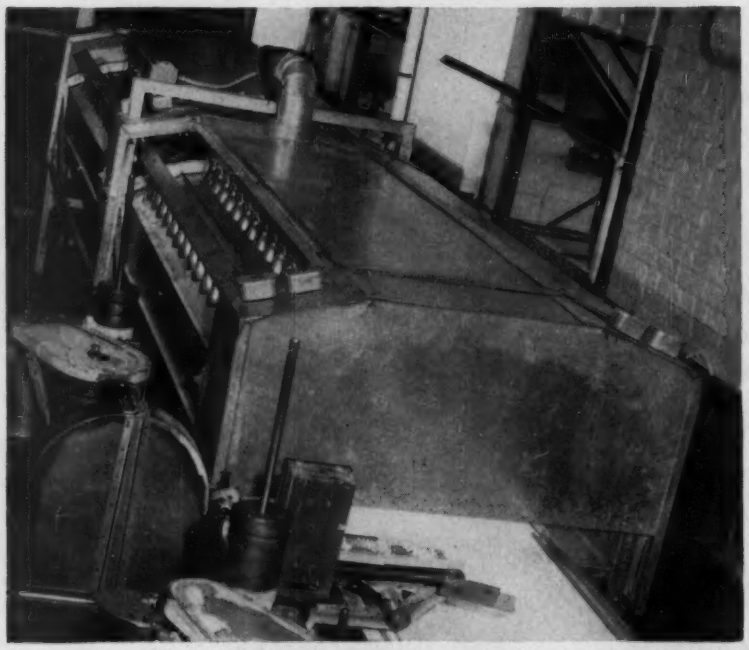
Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Other offices: Akron • Boston • Chicago • Los Angeles • New Orleans • Tulsa

ENJAY BUTYL

Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.



MOIST SACCHARIN TABLETS coming from foreground tablet machines are baked by 9-kw infrared oven in 36 minutes. Fan exhausts fumes through oven top

Infrared Does Sweet Job in Pharmaceutical Plant

R. A. SMITH, Power Engineer, New York State Electric & Gas Corp., Norwich, N. Y., and

GORDON DRAKE, Norwich Pharmacal Co., Norwich, N. Y.

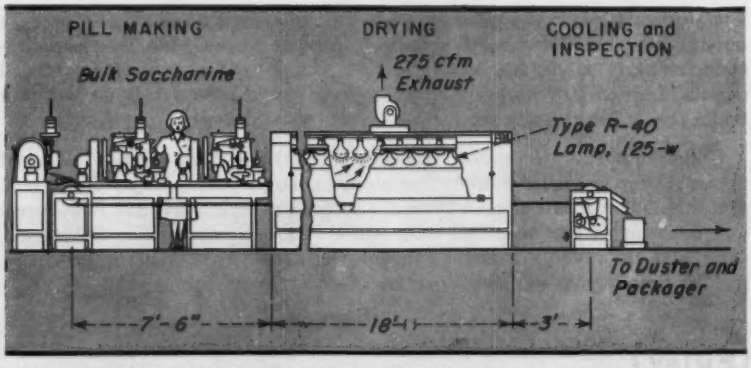
An infrared drier used by the Norwich Pharmacal Co, Norwich, N. Y. to dry saccharin tablets has cut labor costs in half, boosted production 50%, and produced a better, more uniform product. The drier is part of a 29-ft continuous conveyor system which starts with the moist raw material and ends as the finished tablets are dumped into a sifter for dusting and packaging. The infrared system was chosen because it had a low first cost, produced no unpleasant fumes, and did not overheat the tablets.

The 18-ft 9-kw drier uses 128 type R-40 125-w reflector type lamps, mounted above the conveyor belt in eight symmetrically spaced raceways. To bring the tablets up to temperature quickly, the lamps in the first four feet of the oven are operated at the full 230-v line voltage and dissipate ¾ of the total power used by the drier. The remaining lamps operate at half voltage to assure constant heating level without excessive temperatures.

Three tablet machines dump the wet tablets on a 7½-ft approach belt. At the other end of the oven, a 3-ft discharge belt permits the baked tablets to cool and be inspected. By using separate toggle switches for each of the raceways, eight different levels of heat, up to a maximum of 200F, may be obtained. Lamp feeders are divided into two separate groups, each protected by a separate fused disconnect switch. To avoid burning the tablets or the belt during motor failure, a relay, wired to the conveyor motor drive, opens the lines feeding both switches when the motor drive fails.

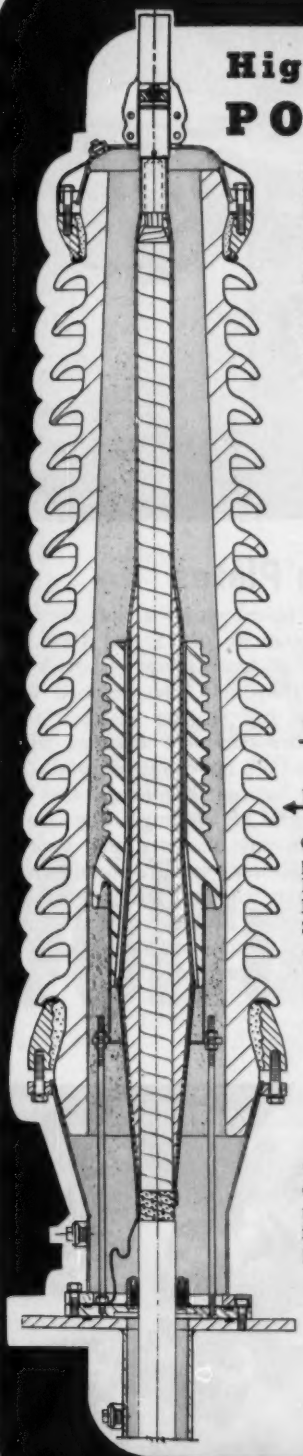
Belt speed may be varied from 6 to 18 inches per minute, providing a maximum drying time of 36 minutes and a minimum of 12 minutes. A 275-cfm centrifugal fan exhausts the vaporized fumes from the drier enclosure via a louvered duct in the oven roof. Heat loss to the working area is minimized by a 1-inch thick layer of fiberglass insulation. All infrared lamps may be easily serviced from the outside.

Before the drier-conveyor system was installed, the tablets were stacked in trays in an open room and air dried. The manufacturing was almost completely a hand operation. Steam heated air was considered and discarded as a drying method because of the longer drying time, possible discoloration of the product, and the employee incovenience caused by the fumes from the process. Dielectric drying was fast but could not dry the tablets properly without the danger of overheating them.



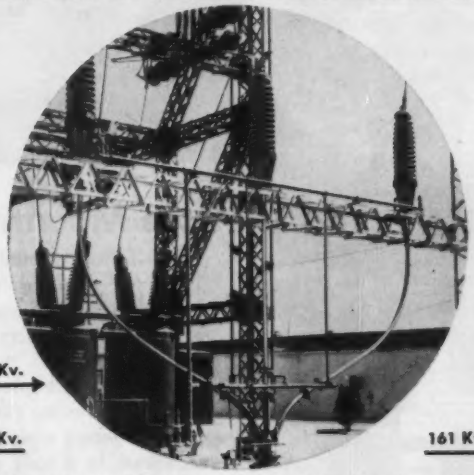
OVEN IS PART OF COMPLETELY conveyorized process which starts with raw, bulk saccharin mixture, dumps the dried, dusted tablets into packaging machine

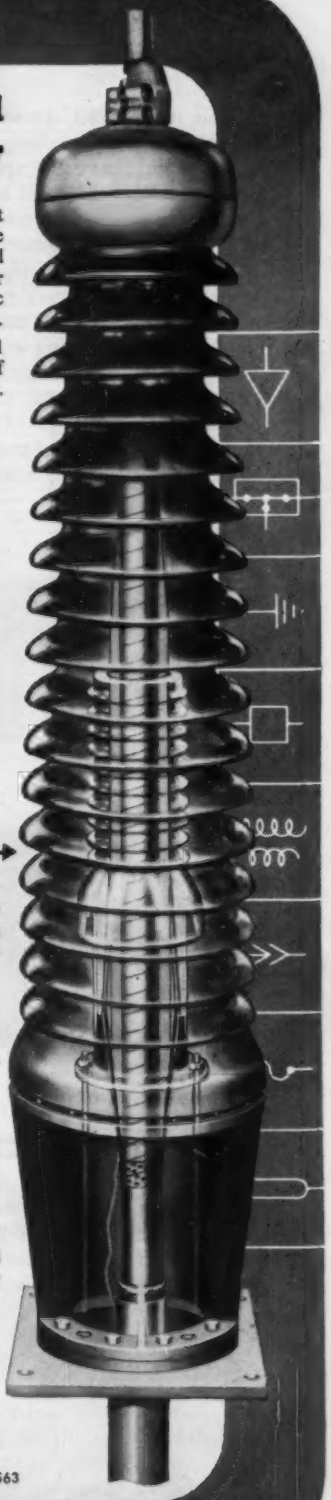
High Pressure . . . Oil Filled
POTHEADS by G&W



Proper treatment of mechanical and electrical stresses permit this simple G&W design. Full 200 pound pipe line oil pressure is retained by the relatively small bore porcelain shell. Tested at 500 p.s.i. pressure. **No castings are used to seal oil under pressure.** Top and bottom fittings are fabricated non-magnetic stainless steel—sealed by fully retained "Resistoyl" gaskets.

Stress relief cone, supplemented by porcelain stress control tube, makes efficient use of the internal diameter and length of porcelain shell—and reduces the amount of installation labor.





G&W Type "ATA" (high pressure) and Type "ATL" (low pressure) oil filled potheads in each voltage class meet the FULL level of electrical characteristics established by American Institute of Electrical Engineers Standards No. 48—WITHSTAND TEST VOLTAGES.

RATED VOLTAGE Kv.	60 cycle Tests RMS Kv.			Impulse Tests
	1 minute Dry	10 seconds Wet	6 hours Dry	1.5x40 ms, Crest Kv. Full Wave
69	175	145	118	350
92	225	190	139	450
115	280	230	163	550
138	335	275	191	650
161	385	315	221	750
230	545	445	315	1050

G&W has supplied potheads (including 230 Kv.) for many of the important oil filled cable installations in U. S. A. and foreign countries. G&W cooperates fully in furnishing complete installation instructions.

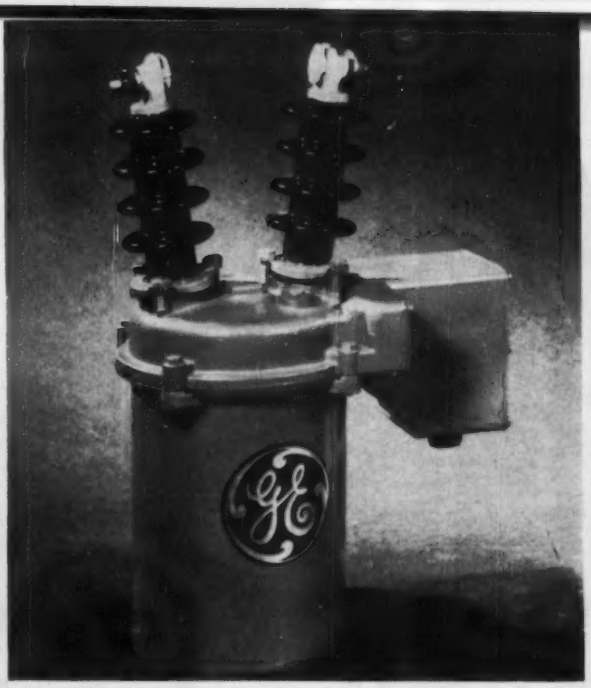
G&W ELECTRIC SPECIALTY CO.
3500 W. 127th Street, Blue Island, Illinois

Representatives in principal cities of U. S. A.
Canadian Mfrs.—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

A563

NEW EQUIPMENT

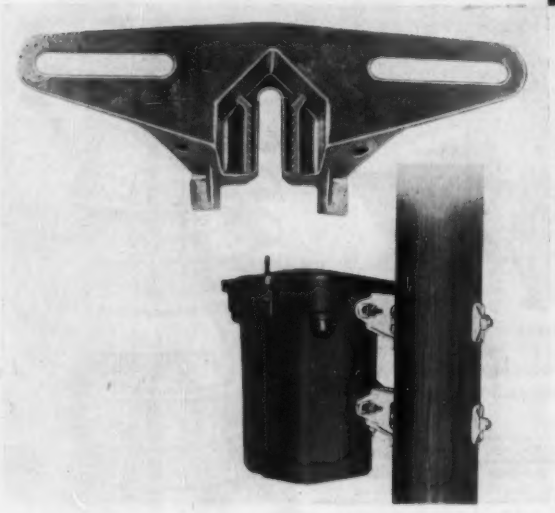
Oil Switch



This model FKC remote control oil switch is intended for switching capacitors, outdoor lighting, and load break applications. A single-phase, 14.4-kv switch, it has a continuous current rating of 200 amp and a momentary rating of 9,000 amp rms symmetrical.

The switch motor mechanism can be controlled by a thermostat, voltmeter, ammeter, or time switch. The number of mechanical links in the operating mechanism is reduced by using printed circuit techniques. The switch bushing and the cover are sealed with nitrile rubber bushings. One-way shaft-handle seal minimizes thermal-cycle breathing.

General Electric Co., Schenectady 5, N. Y.



Pole Mounting Plates

Transformer mounting plates shown at left are intended for direct pole mounting of 75 and 100-kva single-phase and 75 and 112.5-kva 3-phase EEI-NEMA standard transformers. They may also be used for older transformers where lug spacing matches the plate slots. All plates are one-piece castings with integral reinforcing ribs and are hot-dip galvanized.

Broad wings with long horizontal slots are said to accommodate a wide range of lug spacing. The channel back is reported to fit any diameter pole easily. According to the manufacturer, serrated reinforcing ribs prevent bolt from turning when the nut is tightened and make the plates jump-proof. Plates are said to attach to transformers easily without special tools.

Malleable Iron Fittings Co., Branford, Conn.

Electrical Connectors

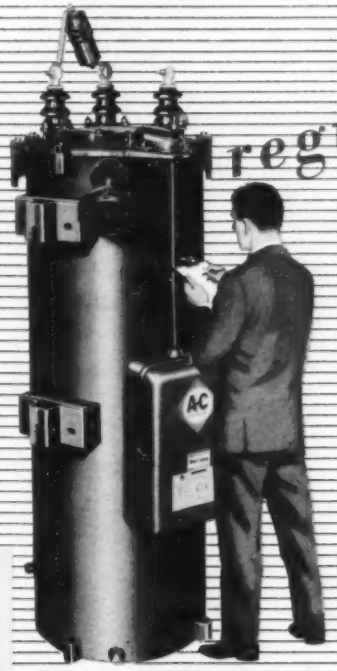
The Series 580 aluminum electrical connectors are said to accommodate a wide variety of cables and make possible major reductions in conductor clamp inventories. These heavy duty U-bolt clamps, with universal, parallel spacer grooves, can be used on ACSR from No. 2 to 715.5 Mcm and on sizes No. 2 to 800 Mcm stranded aluminum conductor.

Of all-aluminum construction, the clamps are said to have generous dimensions which impart added strength and reliability. The manufacturer claims they have been subjected to currents producing conductor temperatures of 200 F with no significant change in connection resistance.

Aluminum Co. of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa.

(More New Equipment on page 113)

key to low cost regulation



Single
Phase

DISTRIBUTION TYPE

Voltage Regulators

by

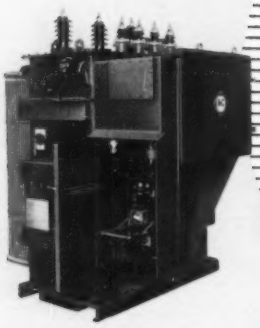
ALLIS-CHALMERS

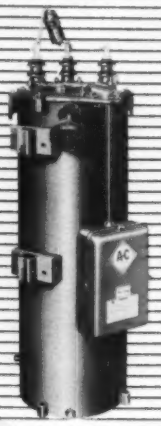
Originators of:

- ⅝% Step Regulators
- Unit-Construction
- Vari-Amp

A-5307

Allis-Chalmers regulators





Handy guide

How to use this chart

1. Select substation size. Example: 5000 kva, 219 amperes, 13,200 volts, self-cooled.

2. Determine percent regulation required. Few systems need a full ± 10% today. Remember that the *Vari-Amp* makes possible unique ranges, such as + 7½% — 10%, or + 5% — 10%, etc.

3. Select proper size regulating unit based either on current or kva, and range of regulation required. You have several choices. Example:

A. The usual way: Select LTC for your 5000-kva transformer. This provides ± 10% regulation.

B. Select regulator for ± 10% from adjacent table under first two columns which give voltage and kva. The size chosen would be Catalog No. 10-07.6-167 rated 167 kva, 7620 volts, 219 amperes at ± 10% regulation.

C. The money-saving way: Select regulator to fully utilize *Vari-Amp* capabilities. Figure regulation needs on basis of setting permanent taps of transformer up 5%.** It is then necessary to get only an additional 5% raise from the regulator. On maximum load the transformer raises voltage 5%, regulator 5% . . . a net raise of 10%.

On minimum load the transformer raises voltage 5%; regulator lowers voltage 10%, which gives a net result of — 5%. The regulator is allowed to go to — 10% because load current has dropped below the 10% current rating of regulator.

This requires the regulator to carry 5000 through kva or 219 amperes at + 5% *Vari-Amp* position.

Step 1: Enter chart at three-phase circuit voltage. Go down column to 13,200-volt bracket. **Step 2:** Go across chart and seek minimum size regulator for 5000 kva or greater. Note that a 167-kva unit providing 10% regulation will do the job. But let's see if a smaller one will work. If we go to 5% regulation column, three-phase circuit kva, there's a unit for 5486 kva . . . Catalog No. 10-07.6-114.3. This is the minimum size unit.

4. COMPARE PRICE

LTC on transformer with ±10% regulation .	$14,551
3 Distribution regulators with ±10% regulation	11,670
3 Distribution regulators providing +10% −5% regulation utilizing 5% tap on transformer	9,384
SAVING using *Vari-Amp* . . .	**$5,167**

** On some ratings alternate voltage can be used on low voltage winding instead of using permanent taps.

KVA Per Each Regulator at ±10% Regulation	Circuit Voltage 1φ	Circuit Voltage 3φ	CIRCUIT KVA AND CURRENT 10% Regulation: Amp Per Regulator	Circuit KVA 1φ	Circuit KVA 3φ
25	2500	4330Y	100	250	750
37.5	2500	4330Y	150	375	1125
50	2500	4330Y	200	500	1500
75	2500	4330Y	300	750	2250
100	2500	4330Y	400	1000	3000
25	2500	2500 Open △	100	250	433
37.5	2500	2500 Open △	150	375	649.5
50	2500	2500 Open △	200	500	866
75	2500	2500 Open △	300	750	1299
100	2500	2500 Open △	400	1000	1732
25	5000	8660Y	50	250	750
50	5000	8660Y	100	500	1500
75	5000	8660Y	150	750	2250
100	5000	8660Y	200	1000	3000
25	5000	5000 Open △	50	250	433
50	5000	5000 Open △	100	500	866
75	5000	5000 Open △	150	750	1299
100	5000	5000 Open △	200	1000	1732
11.4	7620	13200Y	15	114	342
19.1	7620	13200Y	25	191	573
38.1	7620	13200Y	50	381	1143
57.2	7620	13200Y	75	572	1716
76.2	7620	13200Y	100	762	2286
114.3	7620	13200Y	150	1143	3429
167	7620	13200Y	219	1670	5000
34.5	13800	13800 △	25	345	598
69	13800	13800 △	50	690	1195
34.5	13800	13800 Open △	25	345	598
69	13800	13800 Open △	50	690	1195
36	14400	24940 GRY	25	360	1080
72	14400	24940 GRY	50	720	2160
144	14400	24940 GRY	100	1440	4320

Step 1

Step 2

ALLIS-CHALMERS

with *Vari-Amp*
cost 25-30% less than LTC*
to low cost voltage regulation

*Transformers with load tap changers.

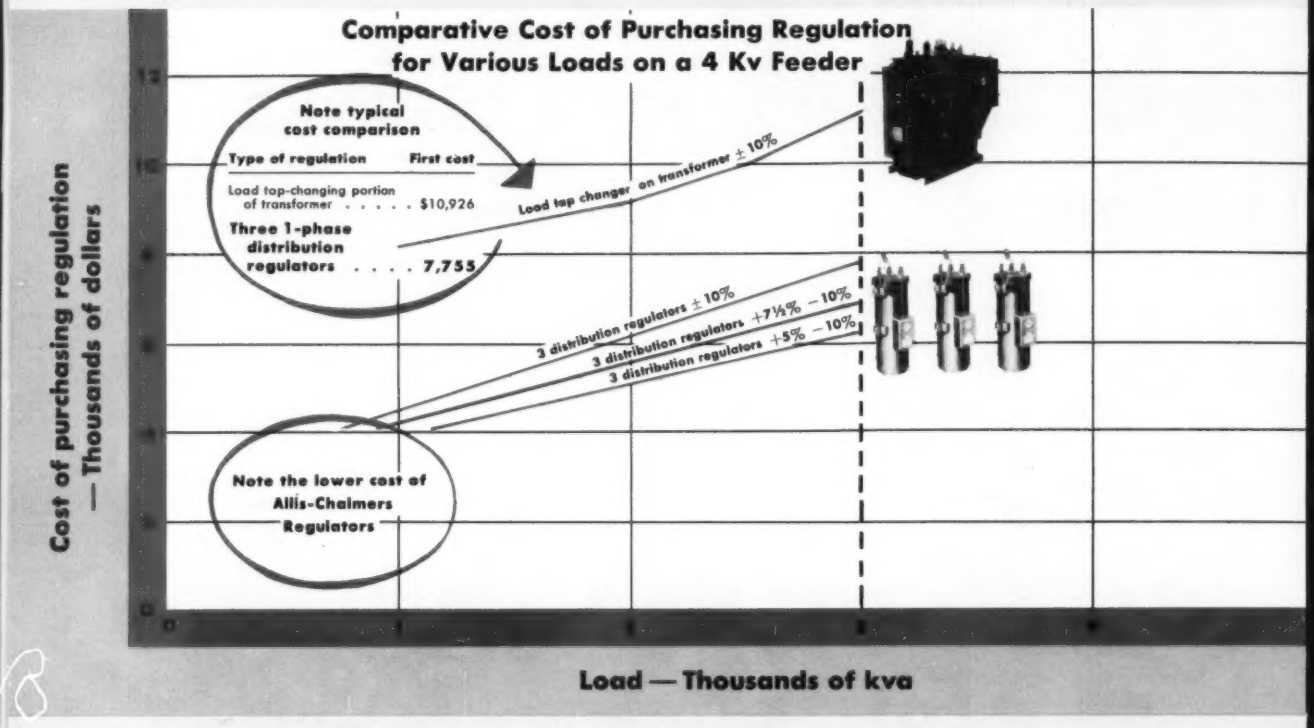
USE CHART TO FIND YOUR SAVINGS WITH *VARI-AMP*

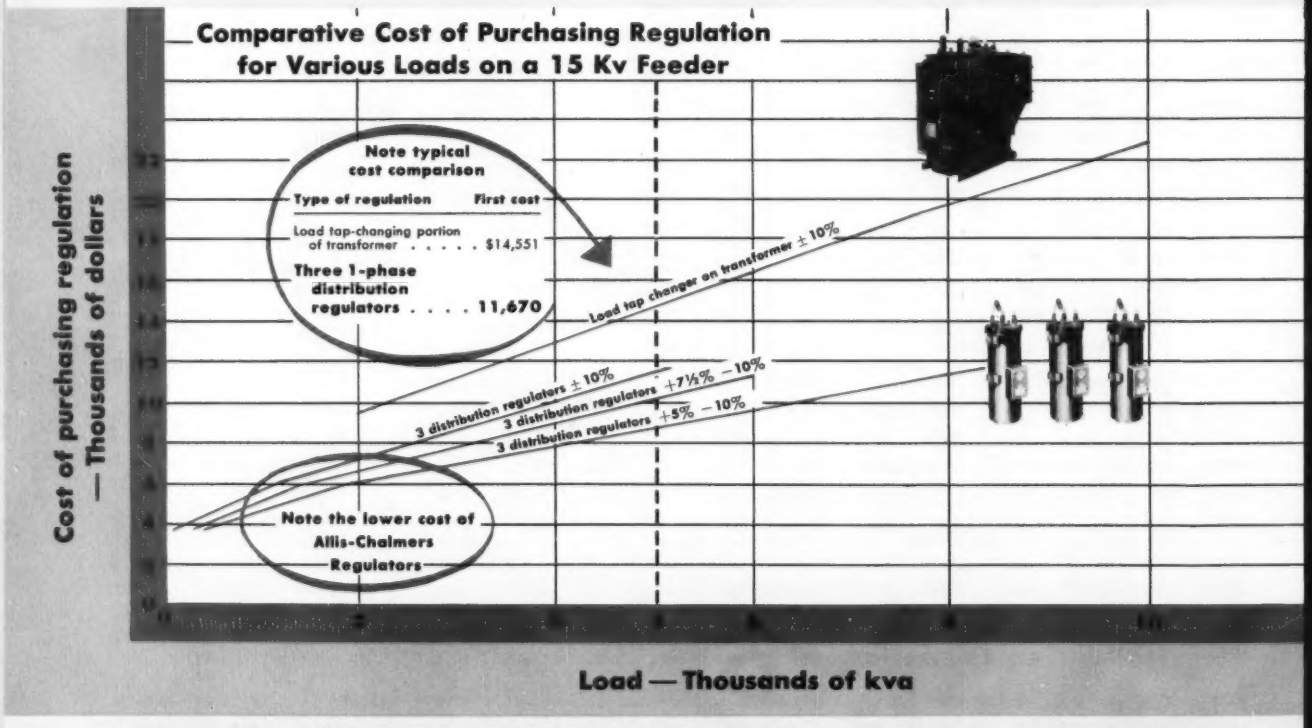
CIRCUIT KVA AND CURRENT													
8¾% Regulation			7½% Regulation			6¼% Regulation			5% Regulation			Regulator Catalog Number	Net Price Each
Amp Per Regulator	Circuit KVA		Amp Per Regulator	Circuit KVA		Amp Per Regulator	Circuit KVA		Amp Per Regulator	Circuit KVA			Eastern Zone / Western Zone
	1φ	3φ		1φ	3φ		1φ	3φ		1φ	3φ		
110	275	825	120	300	900	135	338	1013	160	400	1200	10-02.5-025.0	$1438 / $1459
165	413	1238	180	450	1350	202.5	506	1519	240	600	1800	037.5	1603 / 1627
220	550	1650	240	600	1800	270	675	2025	320	800	2400	050.0	1768 / 1794
330	825	2475	360	900	2700	400	1000	3000	400	1000	3000	075.0	2250 / 2294
400	1000	3000	400	1000	3000	400	1000	3000	400	1000	3000	100.0	2585 / 2624
110	275	476	120	300	519	135	338	585	160	400	692	10-02.5-025.0	1438 / 1459
165	413	714	180	450	779	202.5	506	877	240	600	1039	037.5	1603 / 1627
220	550	952	240	600	1039	270	675	1169	320	800	1385	050.0	1768 / 1794
330	825	1429	360	900	1558	400	1000	1732	400	1000	1732	075.0	2250 / 2294
400	1000	1732	400	1000	1732	400	1000	1732	400	1000	1732	100.0	2585 / 2624
55	275	825	60	300	900	67.5	338	1013	80	400	1200	10-05.0-025.0	1582 / 1605
110	550	1650	120	600	1800	135	675	2025	160	800	2400	050.0	1912 / 1940
165	825	2475	180	900	2700	202.5	1013	3038	240	1200	3600	075.0	2352 / 2387
220	1100	3300	240	1200	3600	270	1350	4050	320	1600	4800	100.0	2696 / 2736
55	275	476	60	300	519	67.5	338	585	80	400	692	10-05.0-025.0	1582 / 1605
110	550	952	120	600	1039	135	675	1169	160	800	1385	050.0	1912 / 1940
165	825	1428	180	900	1559	202.5	1013	1753	240	1200	2078	075.0	2352 / 2387
220	1100	1905	240	1200	2078	270	1350	2338	320	1600	2771	100.0	2696 / 2736
16.5	126	378	18	137	411	20.25	154	462	24	183	549	10-07.6-011.4	1257 / 1276
27.5	210	630	30	229	688	33.75	258	774	40	306	917	019.1	1665 / 1690
55	419	1257	60	457	1372	67.5	514	1543	80	610	1829	038.1	1961 / 1990
82.5	629	1888	90	686	2059	101.25	772	2317	120	915	2746	057.2	2236 / 2269
110	838	2515	120	914	2743	135	1029	3086	160	1219	3658	076.2	2524 / 2562
165	1257	3772	180	1372	4115	202.5	1543	4629	240	1829	5486	114.3	3128 / 3175
240.9	1837	5511	262.8	2004	6012	295.65	2255	6764	350.4	2672	8016	167.0	3890 / 3948
27.5	380	657	30	414	717	33.75	466	806	40	552	956	10-13.8-034.5	1961 / 1990
55	759	1314	60	828	1434	67.5	932	1612	80	1104	1912	069.0	2524 / 2562
27.5	380	657	30	414	717	33.75	466	806	40	552	956	10-13.8-034.5	1961 / 1990
55	759	1314	60	828	1434	67.5	932	1612	80	1104	1912	069.0	2524 / 2562
27.5	396	1188	30	432	1296	33.75	486	1458	40	576	1728	10-14.4-036.0	3151 / 3198
55	792	2376	60	864	2592	67.5	972	2916	80	1152	3456	072.0	3399 / 3450
110	1584	4752	120	1728	5184	135	1944	5832	160	2304	6912	144.0	3709 / 3765

Vari-Amp control provides increased current capacity up to 160% at ±5% regulation—up to 400 amperes. Adjustment of regulating range can be made while regulator is in service.

Prices subject to change without notice

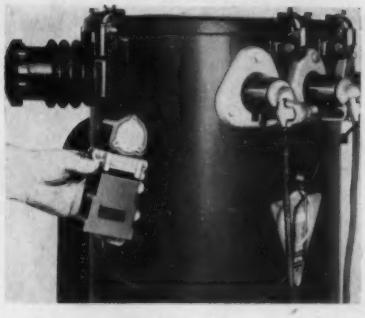
Charts Prove 25-30% Savings Using Regulators


Comparative Cost of Purchasing Regulation
for Various Loads on a 4 Kv Feeder
Note typical cost comparison
Type of regulation
First cost
Load tap-changing portion of transformer $10,926
Three 1-phase distribution regulators 7,755
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators +7½% −10%
3 distribution regulators +5% −10%
Note the lower cost of Allis-Chalmers Regulators
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva


Comparative Cost of Purchasing Regulation
for Various Loads on a 15 Kv Feeder
Note typical cost comparison
Type of regulation
First cost
Load tap-changing portion of transformer $14,551
Three 1-phase distribution regulators 11,670
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators +7½% −10%
3 distribution regulators +5% −10%
Note the lower cost of Allis-Chalmers Regulators
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva

- For further information call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS



Thermal Indicators

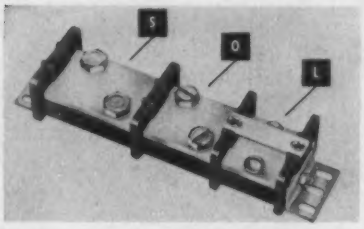
These transformer thermal overload indicators have a permanent magnet mounting device to facilitate use on transformers already in service. Placed near the top oil level, at any convenient location around the tank, they are said to provide a visual signal when the top oil temperature goes too high. One model uses a luminous drop-out tube, another has a red light in a drop-out tube.
Line Material Co, Milwaukee 1, Wis.

Snap-around Volt-ammeter

This snap-around type volt-ammeter, the model RS-1 Amprobe, has a built-in range switch which is used to select any one of six ranges: 0—5 amp, 0—15 amp, 0—40 amp, 0—100 amp, 0—150 v, or 0—600 v. Manufacturer claims that since only one scale is visible at a time, readings can be made faster and more accurately. Full-scale accuracy on any range is said to be ±3%.
Other reported features are bayonet-type voltage leads, long needle sweep, a pointer lock, shielded core magnet movement, a magnifying dial cover, and printed circuit components. A fitted leather case can be hooked on the belt.
Pyramid Instrument Corp, Lynbrook, N. Y.

Terminal Blocks

Three new terminal blocks, designated types "S", "O", and "L", have been developed for power wire



termination. All three are rated 750 v ac, terminal-to-terminal and terminal-to-ground. Type "L" is rated 100 amp, and is furnished with ¼ in. screws for No. 1 wire lugs; type "O" is rated at 125 amp, has $\frac{5}{16}$ in. screws for 1/0 wire lugs; and type "S" is rated at 225 amp with ⅜ in. screws for 4/0 wire lugs.
Curtis Development & Mfg Co 3250 N. 33rd St, Milwaukee 16, Wis.

Re-rated Motors

A line of improved, integral-hp, a-c motors, re-rated to meet new NEMA standards, is available in a 254U frame size.

Straight-through ventilation with tandem fans is claimed to insure low internal temperatures. Even with free, factory-installed end-head screens in place, motor rise is said to be 40C. Slot insulation is laminated Mylar and paper. Removable end-head cover plates permit bearing inspection.

Lead numbers are impregnated into insulation subsurface to resist wear. One-piece, shrouded end-heads, with internal baffles, are reported to provide splashproof construction with complete protection against falling objects and moisture.
Robbins & Myers, Inc., Springfield, Ohio

More New Products

Phaostron Instrument & Electronic Co., 115 Pasadena Ave., South Pasadena, Cal., has a **core magnet meter movement** which is claimed to be sensitive as low as 20 μa with a 3,000-ohm coil and to have good linearity over a 100-deg scale arc.

Assembly Products, Inc, Chesterland, Ohio, sells a **temperature control unit** made by combining a "Thermistor" bridge circuit with indicating and controlling contact meter-relay.

Hyster Corp., Portland, Ore., has developed a straddle, clamshell-type **pole carrier** that is reported to reduce significantly the manual labor in pole handling.

Automatalite Division of Carpenter Mfg. Co, Somerville, Mass., has added a unit to its line of "Watchmaster" automatic **emergency lights** that is said to feature floodlight-type sealed-beam lampheads; a device that helps prevent water loss in batteries; and another that prevents corrosion formations around battery terminals.

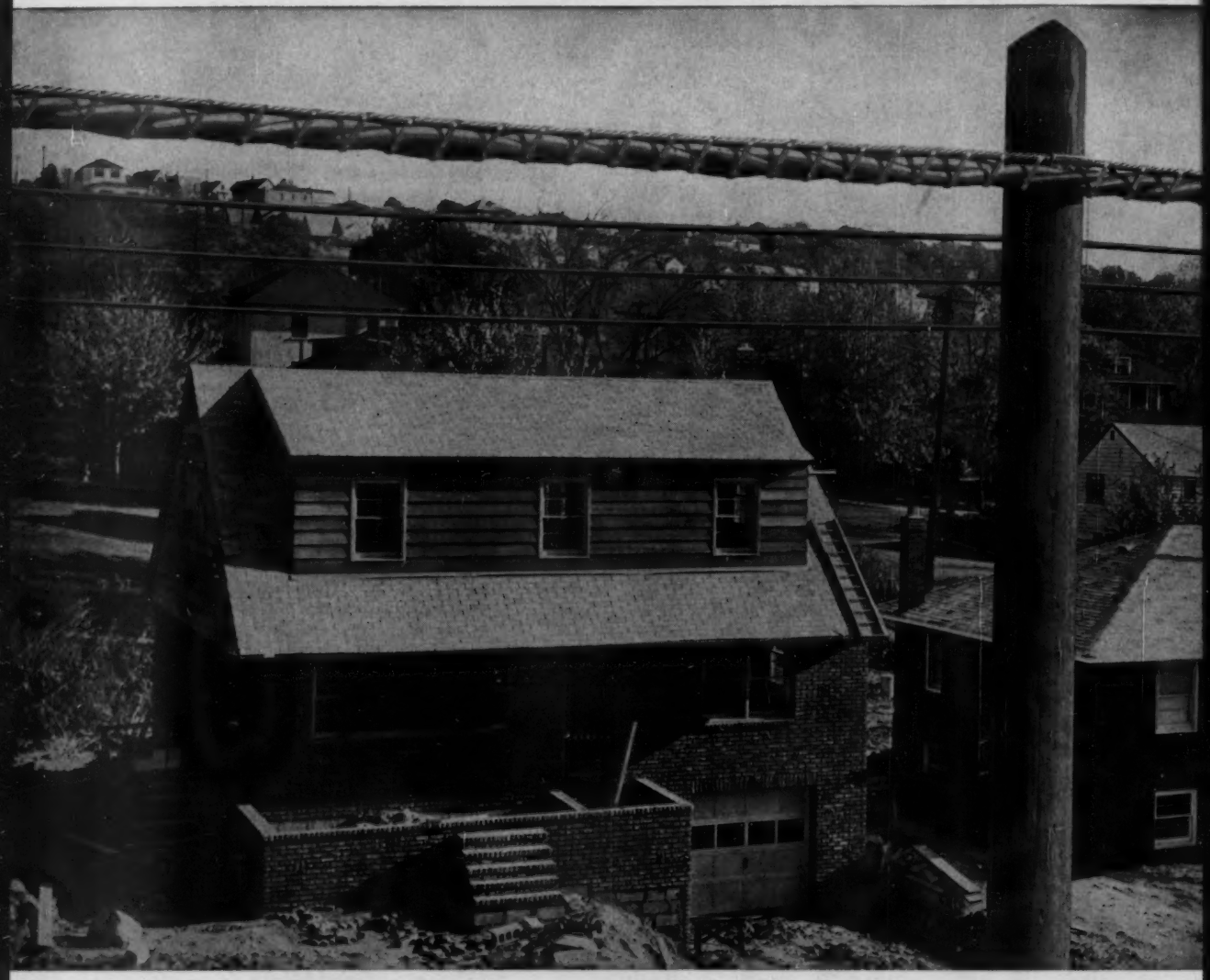
The Polymer Corp. of Pennsylvania, Reading, Pa., now has **Teflon tubing** in AWG sizes 0 to 7, 28 and 30 in addition to the previously available sizes 8 to 26.

National Standard Co., Niles, Mich., has copper-coated, steel **communications wire** in diameters from 0.064 to 0.2893 in. It is available in 30 and 40% conductivities in high strength and 30% in extra high strength as additions to the Copperply line.

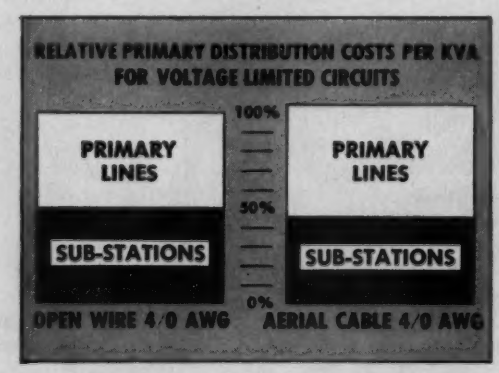
International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill., has expanded its line of "all-wheel-drive" **trucks** through the addition of four 6-wheel-drive models and two 4-wheel drive models.

A. W. Haydon Co., Waterbury, Conn., have a line of **elasped time indicators.** The 7500 Series dc units use chronometrically-governed dc motors, the 12500 Series ac use 50 or 60-cycle motors, and the 24200 Series employ synchronous 400-cycle motors.

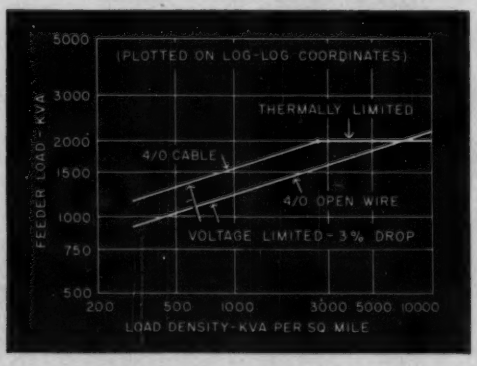
Get more load area coverage for



4/0 AERIAL CABLE vs 4/0 OPEN WIRE

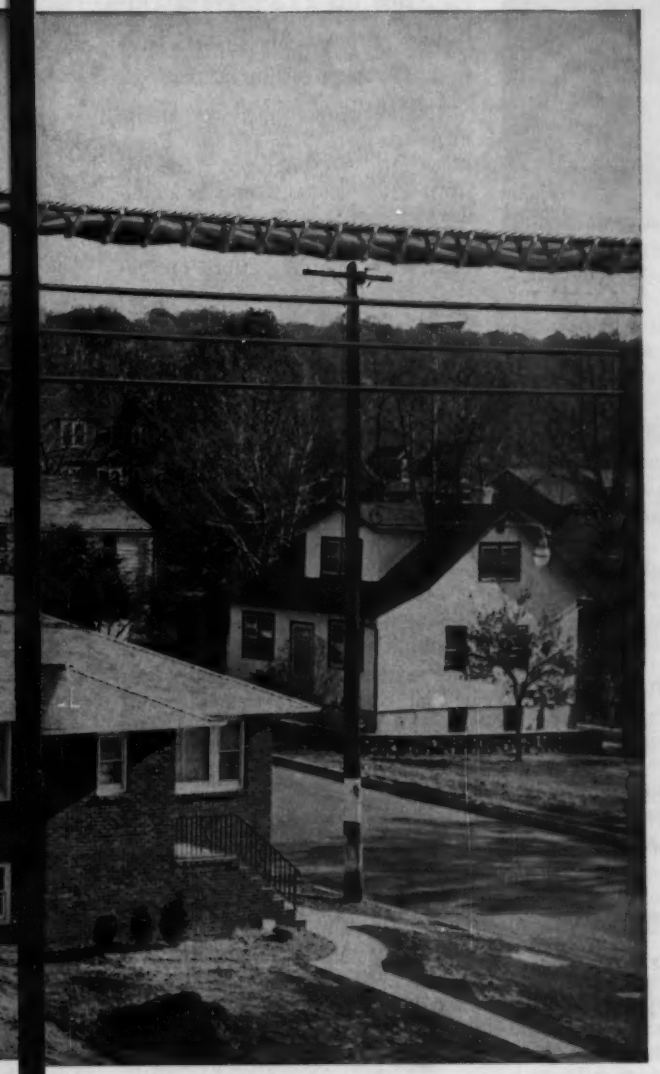


COST—Comparative primary distribution costs per kva for voltage limited circuits at 4160 volts.



FEEDER LOADING—Load density characteristics of 4160-volt feeders with 3% voltage drop limitation.

growing residential areas with



GENERAL ELECTRIC
AERIAL CABLE

General Electric Super Coronol* aerial cable installations can help you meet increasing power demands in growing residential areas. Because of their lower reactance, these preassembled cables can carry far more load within a permissible voltage drop than open wires of the same conductor size. This means that larger areas can be covered than with open wire construction in voltage-limited distribution lines with these results:

1. Reduction in number of feeders required.
2. Use of larger substations.

Both of these advantages result in lower cost per kva of installed substation capacity.

The graphs at lower left show why the initial cost of an aerial cable installation, considered on a realistic basis of cost per kva of load (instead of cost per mile of line) is only 3 to 12% more than for open wire.

In addition, G-E aerial cable gives you:

BETTER APPEARANCE because crossarms, insulators, and unsightly open wire lines are eliminated.

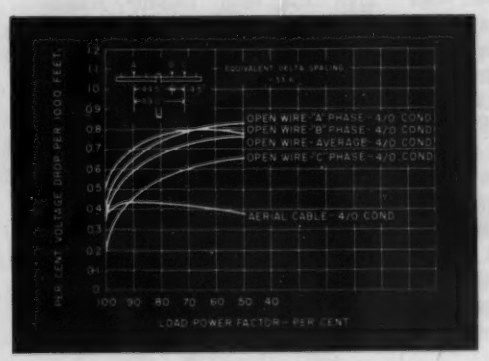
LOWER MAINTENANCE COSTS because there is less chance for storm damage, less need for tree trimming.

FEWER OUTAGE REVENUE LOSSES because messenger-supported cables are far less vulnerable to damage by weather and falling trees. Better service continuity improves customer relations.

INCREASED LOADS. Greater loads can be carried on voltage-limited 4160-volt feeders, up to a load density of 7500 kva per square mile, because of the combination of the low reactance and 85 C copper temperature of G-E Super Coronol preassembled aerial cable.

For additional facts send for a copy of "Economic Performance of Aerial Cable for Distribution Systems." Address Section W171-227. Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company.


PER CENT VOLTAGE DROP PER 1000 FEET
EQUIVALENT DELTA SPACING
OPEN WIRE-'A' PHASE-4/0 COND
OPEN WIRE-'B' PHASE-4/0 COND
OPEN WIRE-AVERAGE-4/0 COND
OPEN WIRE-'C' PHASE-4/0 COND
AERIAL CABLE-4/0 COND
100 90 80 70 60 50 40
LOAD POWER FACTOR-PER CENT

VOLTAGE DROP—Voltage regulation per 1000 feet 4160-volt feeders, 1000 kva base, 3 phase.

Progress Is Our Most Important Product

GENERAL ELECTRIC

San Leandro Lights Up with L-M Fixtures

Shopping area of San Leandro, Calif., is now lighted by 102 new fluorescent luminaires. The new lights provide a modern system and add to the safety in that area. They provide reportedly 17 times more light for only six times as much energy.

All luminaires were furnished by Line Material Co, Milwaukee, Wis. The lighting installation includes: 101 V-type luminaires, each having four 100-w lamps providing 21,200-lumen output, and one Delta-type luminaire with six 100-w lamps, providing almost 32,000-lumen output, used at the street Y-intersection (in center of illustration).

The luminaires are mounted on 30-ft steel standards supplied by the city. They are served by ten 240-v underground multiple circuits. A 120/240-v outlet is furnished on each luminaire for festoon lighting. These are fed by ten separate 120/240-v circuits.

This new lighting system replaces a 30-year old system of 48 2,500-lumen decorative incandescent lamps.

A 170,000-sq ft Condenser Is Shipped to Detroit Ed

A single-shell, 170,000-sq ft surface condenser has been shipped by Worthington Corp from its Harrison, N. J., Division to Detroit Edison Co's River Rouge power plant. Here the heat exchanger will be installed for turbine-generator No. 3.

This massive condenser will contain almost 20,000 40-ft Admiralty tubes. The assembled condenser occupies a space 69 ft long, 26 ft wide, and 34 ft high. Its dry weight is nearly 600 tons, and when it is in service, nearly 1,000 tons.

Steam will be exhausted to this condenser from an Allis-Chalmers cross-compound reheat turbine-generator. This generating unit is designed for 2,400 psig, 1,000 F steam at the throttle, and rated 320,000-kw capability at 1.0 in Hg abs. back pressure. A net plant heat rate of 8,620 Btu per kwhr is expected from No. 3 unit. This is some 260 Btu lower than for units No. 1 and 2, each rated at 260,000 kw capacity.

Order for IBM "Brain" Placed by Union Carbide

First order for International Business Machines Corp's new electronic data processing machines has been placed by Union Carbide & Carbon Corp. The system, IBM 709, in a typical installation will lease for about $56,000 a month. Sales price for the machines is $3 million.

The equipment will work with equal facility on both commercial and scientific or engineering calculations, IBM announced. System's flexibility will reportedly assist Union Carbide management in current operation and future planning decisions ranging from plant location to sales forecasting. A variety of routine and specialized accounting problems will also be handled by the 709.

Atomic Orders

. . . are up 213% Westinghouse President Price tells financial writers in Pittsburgh

Unfilled orders for atomic equipment are up 213%, Gwilym Price, president, Westinghouse Electric Corp told financial writers at an all-day conference in Pittsburgh.

He said that "Westinghouse has built, or is building, more nuclear reactors designed specifically to produce power than all other companies in the U. S. combined—and to our knowledge, in the world."

Commenting on the overall backlog picture, he gave these comparative figures of unfilled orders at Nov. 30, 1956 as against Dec. 31, 1954:

- Apparatus products (heavy electrical equipment). . up 86%.
- General products (elevators, fractional motors, etc.). . up 55%.
- Defense products . . down 24%.
- Atomic power . . up 213%.

Westinghouse had net income after taxes but before "LIFO" (last in first out inventory method) of $15,537,000 equivalent to 82¢ a share in 1956. However, Price said, if you deduct $12,045,000 for "LIFO" net income would be only $3,492,000, or 10¢ a share. For 1957 he estimates earnings at about $4 a share after "LIFO."

As far as atomic power is concerned, the company is not making any money at present but "is playing for a position of leadership in the field when atomic power begins to pay off," Price said.

A. C. Monteith, vice president, apparatus products, pointed out that the production schedule at the South Philadelphia Works is heavy. He said that large turbine schedule boards are full for 1957, 95% for 1958, and 75% for 1959. For the smaller turbines and heat exchangers scheduled production is 90% for '57, 50% for '58, and 25% for '59.

C. J. Witting, vice president, consumer products, said that the company's appliance divisions did a full year's business in the last nine months of 1956 following the strike. He pointed out that appliance sales surpassed 1955 sales in 28 out of 32 product categories.

Brighter Plating Gained By New Cadmium Process

Hanson-Van Winkle-Munning Co has introduced a cadmium plating process that increases brightness up to 10%, brighter life 400%, and plating speeds up to 10%, a company spokesmen announced recently.

Used for corrosion protection on iron and steel, the process is said to eliminate subsequent bright dip for many applications. Other uses include protection for non-ferrous metals against surface tarnish, corrosion, or galvanic couples formed in assemblies.

Ford's New Truck Line Hits Utility Market

Nearly 300 different models of Ford Motor Co's 1957 truck line were delivered to dealers Feb. 1. Changes in styling and power capacity cost $77 million to put into production, Ford announced.

Features of the line are pickup models with 25% bigger load area; a series of six tilt-cab transports; and greater payload capacities in medium and heavy duty models.

Engine power has been raised an average of 8%. Four basic power plants are offered, with 27 different modifications available for special hauling service, the company said.

Copper Produced in 1956

U. S. primary copper production for 1956 was a high of approximately 1,131,810 tons, according to the Copper Institute, New York. This total was an increase of about 95,110 tons over the production of 1,036,702 tons in 1955. Refined copper produced in U. S. in 1956 totalled almost 1,580,290 tons, another high, up approximately 112,840 tons from 1,467,448 tons the previous year.

Copper deliveries to fabricators was about 1,465,900 tons, another high mark in 1956, an increase of some 19,540 tons above 1,446,354 tons in 1955. Refined stocks in U. S. at the end of 1956 amounted to 120,645 tons a record, almost a 100% increase of the 61,554 tons at the end of 1955.

M&M BRIEFS

Fischer & Porter Co of Hatboro, Pa., has purchased two tracts totaling approximately 185 acres, to tie in with plans for company expansion. Offices, research laboratories, additional production facilities and a recreational facility are contemplated.

Du Pont Co has made a reduction of $30 in the price of semi-conductor grade silicon, from $350 to $320 per lb. The grade for "solar batteries" was cut from $180 to $150 per lb.

Hubbard & Co of Pittsburgh and Chicago is reported to have purchased the outstanding stock in Illinois Gear & Machine Co, Chicago.

Pennsylvania Transformer Co, Canonsburg, Pa., is offering its 1600 employees polio vaccine shots—three shots over a period of nine months to a year—during working hours. Posters carry the slogan "Let's all bare arms to conquer polio."

GE Supply Co Transfers A & T Dept Headquarters

General Electric Supply Co's Appliance and Television Department headquarters has been transferred to Louisville, Ky., from Bridgeport, Conn., effective February 1, 1957.

A previous item (EW, Jan. 14, p 99) stated that the company's headquarters was to be transferred. This, of course, was erroneous. It should have referred to the headquarters of one of the company's departments, namely, Appliance and Television Department. The company's headquarters are at 1260 Boston Ave, Bridgeport, Conn.

Gas Turbine Usage

. . . is on the increase says GE; 50% more than 1955

Rapid increase in the number of General Electric Co gas turbines placed in service, coupled with an expanding usage in new and different applications, was reported by L. G. Naylor, Gas Turbine Department Manager-Marketing, in a review of 1956 business.

New applications using gas turbines have increased 50% over the number placed in service in 1955, said Naylor.

Newest industrial usage is in a rubber factory where the gas turbine provides both electric power and exhaust heat for a recovery boiler to produce process steam for the plant.

According to John P. Keller, Department General Manager, 114 GE gas turbines have accumulated more than 1.5 million hr of operation. With this experience as a background, the Department is offering a line of gas turbines in a variety of cycles, with ratings ranging from 5,000 to 30,400 hp, and from 4,750 to 21,800 kw.

In December GE shipped to Monterrey, Mexico, two 16,000-kw gas turbines, said to be the largest simple-cycle, single-shaft machines yet produced in the United States.

During 1957 it is expected that the electrical utility industry will see the great potentialities of the gas turbine as a prime mover for peak power generation, remarked Keller. In Orlando, Fla., two gas turbines with a combined capacity of 33,000 kw are expected to be placed in operation to make up the largest known usage of gas turbines for peak power generation in the United States.

In British Columbia, Canada, four GE units are scheduled for the generation of electric power. Two units are rated at 19,750 kw and two at 18,000 kw; combined output is approximately 75,000 kw.

Moreover, in 1957 the Department expects to complete the largest gas turbine yet designed in the Western Hemisphere. This will be a 21,500 kw machine for installation in Caracas, Venezuela.

THE *Perfect Combination*
FOR EFFICIENT STEAM
WATER PLUS *Electric* HEAT

Coates ECONOMY *Electric* BOILERS

Completely automatic. Safe, electric heat... no smokestack needed. Small in size... endless, constant steam supply. Anyone in your shop can operate it—no special skill required. Insulated with mineral wool for maximum efficiency.

FITS ANY SHOP

Coates Electric Boilers are available in sizes 1 to 1000 BHP pressure to suit your needs. Easy to install because all plumbing and wiring connections are on the exterior of the boiler. Every way you look at it... Coates Electric Boilers save you money!

UL and CSA approved—Meets ASME Code

WRITE FOR FREE CATALOG

Coates Electric MFG. CO.

COATES ELECTRIC MANUFACTURING CO.
Dept. EW-2, 3419 11th Ave. S.W.
Seattle 4, Washington
Rush me your catalog and full information on Coates Electric Boilers.
Name.....
Address.....
City..... State.....

"IF IT'S DONE ELECTRICALLY IT'S RIGHT"

SALES ASSIGNMENTS

COMPANY STAFFS

Elliot Co's Lagonda Division has appointed Howard A. Bach as sales manager. He is former assistant sales manager of the division.

General Electric Co has named Paul Kunz as component sales representative for the metallurgical products department in the Texas area with offices in Houston. He replaces Grant Morrison, who transfers to Detroit.

Graybar Electric Co's new district manager in Atlanta is J. E. Fontaine, previously district manager for the Gulf Coast district.

Pittsburgh Reflector Co has announced the appointment of Walter M. Wyman, Jr. to the Philadelphia sales office.

Raytheon Manufacturing Co's Julius Dorfman is new manager of special tubes sales for receiving and cathode ray tube operations.

Sylvania Electric Products, Inc, has designated Lawrence P. Pleasants as product sales manager, industrial-commercial lamp sales of the Lighting Division . . . Richard E. Corcoran will fill the newly created position of product sales manager of wire and weld products for Sylvania's Parts Division.

REPRESENTATIVES

Sprague Electric Co has appointed Ralph B. Black as its representative for Industrial Power Factor Capacitors in New Mexico. R. Elmore & Co of El Paso, Texas, will assume similar responsibilities in Arizona.

NEWS BRIEFS

New England Electric System recently announced plans to merge five northeastern Massachusetts subsidiaries into a single operating company to be called Merrimack-Essex Electric Co. The five utilities, which serve a total of 163,000 customers in 26 municipalities, are Amesbury Electric, Essex County Electric, Haverhill Electric, Lawrence Electric, and Lowell Electric.

Clemson College (S. C.) Board of Trustees has presented a resolution to the state's Congressional delegation calling for modification or abandonment of the Corps of Engineer's proposed Hartwell Dam Reservoir. The college board fears flooding of the area's farm and forest lands by waters from the $100-million multipurpose project planned for the Savannah River Basin..

Why Build Bomb Shelters for Transformers?

Silicone insulated dry-type transformers need no vaults, are safer, more reliable and less expensive.

SAFER . . . no explosion, fire or toxic hazards with silicone insulation.

MORE RELIABLE . . . silicone insulation is inherently more resistant to high ambients, heavy overloads, moisture and corrosive atmospheres.

LESS COSTLY . . . silicone insulation can harness more power per pound. That means smaller transformers that can be installed close to load anywhere in your plant saving space, copper and installation costs.

. . . your power distribution system is more efficient, more flexible and adaptable with silicone insulated dry-type transformers.

. . . silicone insulated dry-type transformers require no expensive vaults or special ventilating systems.

. . . your maintenance costs drop to almost nothing with silicone insulated dry-type transformers. All that's required is an occasional dusting — no liquids to replace or filter.

Mail coupon today for additional information.

Dow Corning Corporation, Dept. 4414, Midland, Mich.

Please send me sources of supply for new Silicone (Class H) ☐ Motors ☐ Transformers

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS
DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D. C.

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

pt *your proof of reliability*

Where is there a more vital need for reliable transformer service than in a major commercial airport? The greater Fort Worth International Air Port uses two Pennsylvania Transformer Company units, both 1000 KVA, three phase, 60 cycles, 150 C rise. Insulated with Dow Corning Silicones, these dry-type transformers carry all power for Fort Worth's field and terminal lighting system. Silicone insulation was specified because it provides a greater guarantee to public safety; is more dependable, and has the overload capacity to handle emergency loads.

Utilities can save up to 75% in soundproofing

with new Westinghouse power transformers

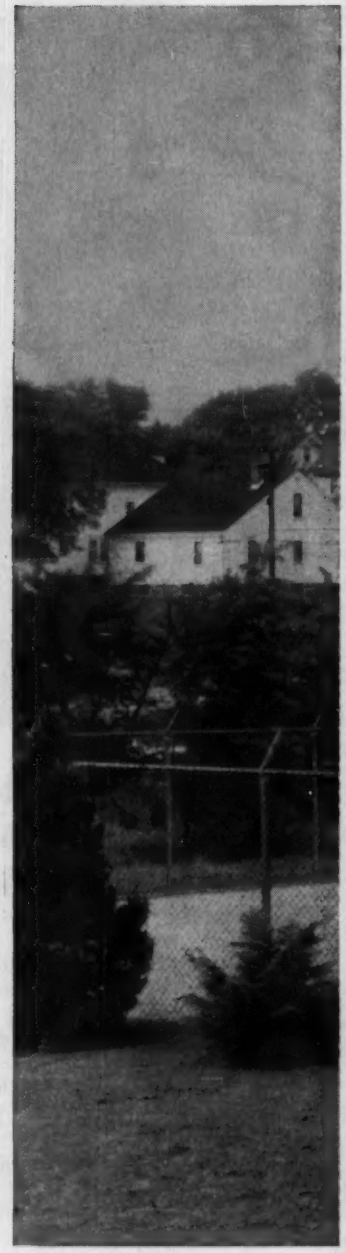
Westinghouse announces drastic reduction in premium costs paid for transformers with lower than standard sound levels. Extensive improvements in manufacture and application of materials have created spectacular new performance available to all users of Westinghouse power transformers. Noise levels can now be reduced for much less cost.

Westinghouse power transformers—already smaller and lighter per kva than transformers of any other design or manufacture—will achieve lower sound levels and promise to show even greater advantage in weight and size comparisons. Here is new performance available for all new purchases of Westinghouse transformers—501 kva up to the world's highest capacity three-phase units.

So here's new help—especially in planning substations where increasing population densities are making transformer noise a real problem. This is welcome news, too, for noise-sensitive areas such as schools and hospitals. In addition to investment savings and improved public relations, consider the advantages of new flexibility in interchange of equipment, and new ease in obtaining rights of way and substation sites.

Anticipated power transformer purchases over the next five years total 300,000,000 kva. Based on this figure, reduction in soundproofing "extras" can reach $30,000,000. This is the performance Westinghouse can deliver—with all new power transformers.

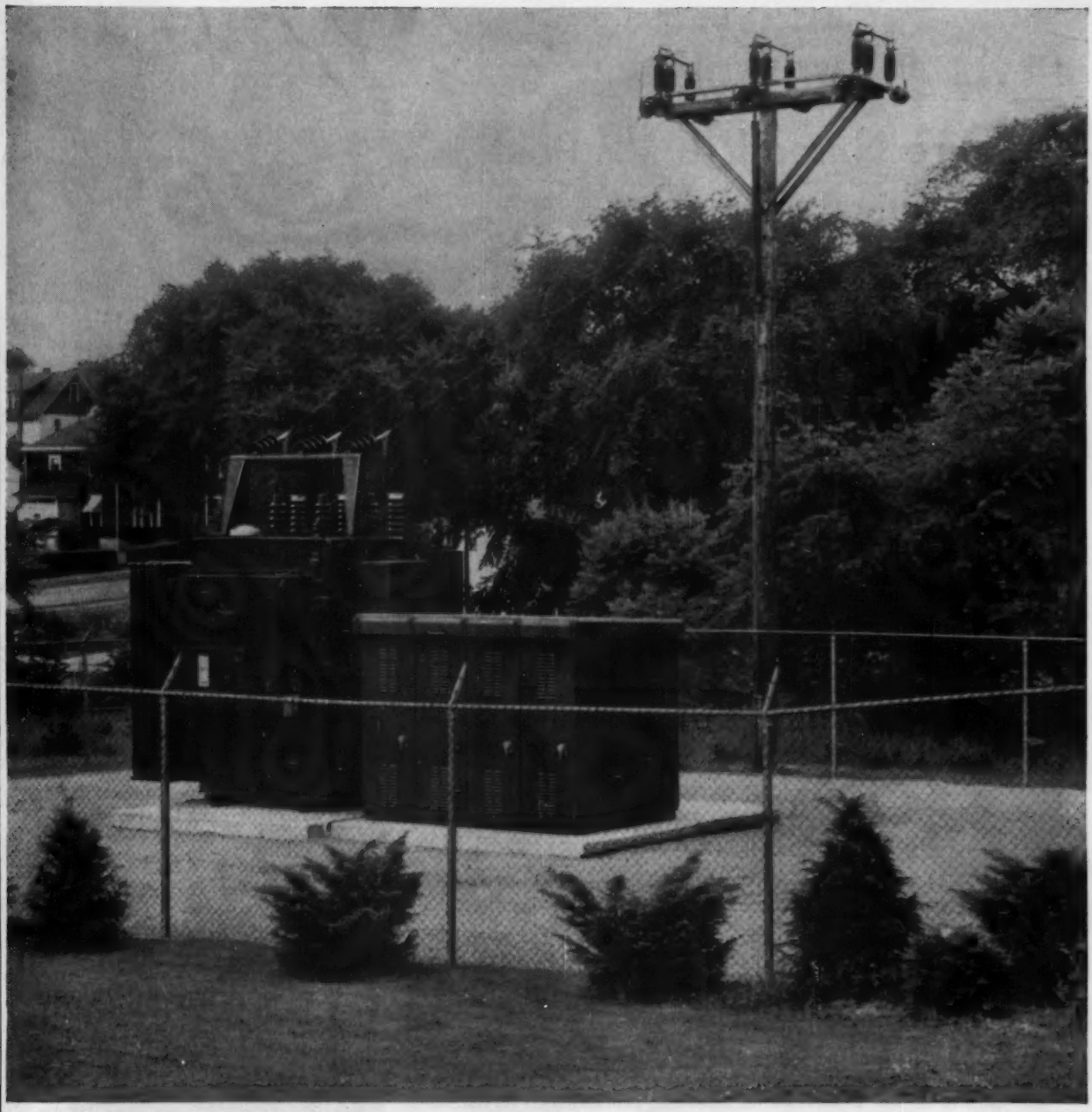
For the full story, call your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70785



Westinghouse now offers you a $11,730 saving on equipment ordinarily invested to cut transformer noise at a typical 10,000 kva neighborhood substation such as this . . . a saving equal to 25% of total equipment cost.

YOU CAN BE SURE...IF IT'S

Westinghouse®



RECOMMENDED NEMA SOUND LEVEL DB.	PER CENT PRICE ADDITIONS FOR REDUCTION IN RECOMMENDED NEMA SOUND LEVEL OF									
	3 DB.		6 DB.		9 DB.		12 DB.		15 DB.	
	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
56 to 60	22	6	41	9	—	—	—	—	—	—
61 to 65	14	5	25	7	55	14	—	—	—	—
66 to 70	8	4	15	5	35	10	—	—	—	—
71 to 75	4.5	3	9	4	20	7	35	14	—	—
76 to 80	2.5	2	5.5	3	11	5	19	10	39	20
81 to 85	2	1	3.5	2	6	3	12	6	23	12
86 to 95	—	1	—	1	—	2	—	4	—	8

Drastic reductions in sound levels offered with all new Westinghouse Transformers make possible the above reduction in premiums previously necessary to achieve these same levels.

NEWS ABOUT PEOPLE

Plymire Named to VP Post

R. F. PLYMIRE

Puget Sound Power & Light Co has recently announced the promotion of R. F. Plymire to vice president. The company has also promoted Ralph M. Davis to secretary.

Plymire, formerly general commercial manager, now will be responsible for the entire revenue side of the company's business, directing both sales and commercial activities. He has been with Puget Sound Power & Light Co since his graduation from the University of Washington School of Engineering in 1930.

Davis, as head of the corporate department, assumes the duties formerly handled by Walter S. Zachary, who retired Dec. 31. He had most recently been chairman of the Washington State Public Service Commission. Davis is a graduate of the University of Washington Law School and entered state government eight years ago.

EDWARD M. SPENCER

Detroit Edison Elects Spencer

Edward M. Spencer has been elected treasurer of the Detroit Edison Co. He replaces Stewart L. Ferguson who will retire on March 1. New assistant treasurer is Phillip D. French.

Spencer, an engineering graduate of the University of Michigan, joined Detroit Edison Co in 1930 and served, successively, in the production, control, and statistical departments. He was made assistant treasurer in 1947. Since 1955, he has been treasurer of Atomic Power Development Associates, Inc.

French has been with Detroit Edison since 1939 and has served in the sales, payroll, and insurance departments.

Hubbard & Co Advances Three Executives

Hubbard & Co has announced the following promotions. Raymond M. Waggoner has been named executive vice president. Howard Jackson, vice president in charge of production, has been given additional responsibility as general manager of Hubbard's Chicago district manufacturing and sales operations. Succeeding Waggoner as general manager of the company's Pacific Coast operations is L. T. Owen.

Waggoner started with Hubbard in 1922 in the Electrical Materials Division in Pittsburgh. He was then appointed assistant sales manager of the Northeastern Division in 1928, and sales manager for the Midwest Division in 1936. He became vice president in charge of sales in 1948.

Jackson joined Hubbard in 1937, served in various production capacities, and was elected vice president of production in 1954.

Owen, also with Hubbard since 1937, has most recently been located in Boise, Idaho, as district sales manager of the company's Mountain territory.

RAYMOND M. WAGGONER

CAN BE INSTALLED ANYWHERE. Here workers begin to feed RoZone-RoSeal cable into conduit inside underground vault of St. John's Hospital. This versatile cable can be used anywhere—in the air, in conduit and ducts, direct in earth, even in water.

EASY TO PULL. Workers at the new St. John's Hospital in Tulsa draw Rome's easy-pulling high-voltage cable from underground switch vault to surface and power transformers. The hospital's architect recognized *all* the advantages of RoZone-RoSeal (see his letter below).

Profit from this architect's experience with Rome's premium high-voltage cable

LEON B. SENTER, A.I.A.
ARCHITECT
906-7 PHILTOWER BLDG.
TULSA, OKLAHOMA

November 28, 1955

Regarding our choice of RoZone-RoSeal cable for St. John's Hospital:

We can tell you that due to the nature of the building, extreme reliability was the first consideration.

Closely following were the requirements of moisture resistance, inductive capacity in the configuration as laid, and uniformity of product.

We found that a specification built around Rome Cable's RoZone-RoSeal satisfied all the above.

Very truly yours,

LEON B. SENTER, A.I.A.

John C. Penafeather

John C. Penafeather
Mechanical Engineer

JCP:lz

He wanted the same things you probably want in a high-voltage cable: reliability, moisture resistance, the right electrical characteristics, and uniformity. He found them all in Rome Cable's RoZone-RoSeal.

You can use this cable anywhere—in the air, in conduit and ducts, buried in earth, *even in water*. Here's how it compares with most conventional thermosetting nonmetallic cables:

- Costs less.
- Greater resistance to moisture and comparable resistance to abrasion, crushing, impact, chemicals, and oils. oils.
- Easier pulling and bending. The RoSeal (polyethylene) jacket has a lower coefficient of friction than any other jacket material. And it bends easily at temperatures as low as −40° C.
- High corona levels on power cables.

Rome Cable's RoZone-RoSeal met this architect's rigid specifications, and it can meet yours, too.

Specify RoZone-RoSeal for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 702 and ask for Bulletin ROT-1. Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

Major General Francis H. Lanahan Made Federal Electric Head

Major General Francis H. Lanahan, USA (Ret.) has been elected president of Federal Electric Corp of Lodi, N. J. Federal Electric is the field service and maintenance subsidiary of International Telephone & Telegraph Corp.

Lanahan joined Federal Electric Corp in 1955 as vice president and general manager, shortly after his retirement from the U. S. Army Signal Corps. He was upped to executive vice president in June 1956.

In other company advancements Vice Admiral Richard H. Cruzen, USN (Ret.), was elected a vice president and Harold E. Young was appointed controller of Federal Pacific Electric Co.

Cruzen started with Federal as a project manager for the DEW line system. Young, formerly assistant controller and assistant treasurer, joined the company in 1946.

FRANCIS H. LANAHAN

Anaconda Co Promotes Perry to VP

The Anaconda Co has announced the election of Vincent D. Perry as vice president.

Perry, chief geologist for Anaconda since 1948, graduated from the University of California in 1922 with a degree in mining engineering. He also holds a master's degree in mining geology obtained from Columbia University in 1924.

He joined the Anaconda organization in 1924 as a mining geologist and has held geological management posts for the company and its subsidiaries throughout the western hemisphere.

VINCENT D. PERRY

PERSONAL BRIEFS

New manager of Oklahoma Gas & Electric Co's Eastern Division is **Clarence M. Smith,** service manager. He succeeds retiring **John T. Naylon.**

S. G. Page has been appointed director personnel of Duquesne Light Co, succeeding the late **John M. Orr** . . . Florida Power & Light Co has named **John T. Moore** as Northwest Division superintendent and **George W. Ferree** as Lake City district manager.

Recently appointed property agent of Pacific Power & Light Co is **Harold Sallee. Charles E. McQueary** assumes his former post as Glenrock district manager.

S. Paul Vecker will retire Feb. 28 as Carolina Power & Light Co's vice president in charge of area development.

Lewis H. Day has been named director of area development for Iowa-Illinois Gas & Electric Co . . . Portland General Electric Co has named **Donald Broehl** resident engineer at its Pelton Dam project. He replaces **Larry Kelsh,** now resident engineer at North Fork.

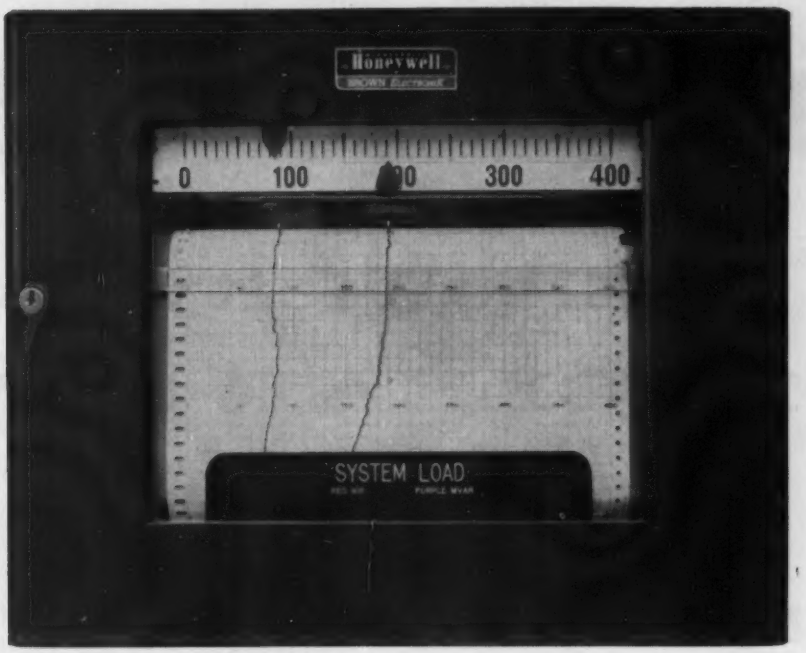
Omaha Public Power District's **Jack L. Wilkins** has been named superintendent of power stations to succeed **C. F. Turner** who has retired . . . **Howard Morgan,** transportation consultant and Oregon Democratic leader, is new public utilities commissioner of Oregon.

The post of superintendent of Gulf States Utilities Co's Liberty district, vacated by retiring **Rhea Hudnall,** has been filled by **C. R. Brinkley.** Succeeding Brinkley as local superintendent at Woodville is **Victor R. Norvell.**

Public Utilities Association of the Virginias has designated the following men as chairman of its five standing committees: **E. C. Bookman** of Virginia Electric & Power Co, accident prevention; **B. G. Atwood** of Potomac Edison Co, area development; **C. F. Cook, Jr,** of VEPCO, publicity; **A. W. McMillan** of Wheeling Electric Co, rural; and **B. D. Painter,** Appalachian Electric Power, sales. In addition, **M. C. Funk** of AEP will head the program committee and **J. C. Parrott** of Roanoke Gas Co will direct the financial.

Edgar T. Hughes has been named chief of Federal Power Commission's Division of Electric Resources and Requirements in the Bureau of Power. The newly created post of deputy general counsel of FPC has been filled by **John C. Mason,** former assistant general counsel.

(Continued on page 140)



Watts and vars at a glance

Choose from three different ways to record load data:

- both variables on a single chart and scale calibration; recorded in inks coded to match dual pointers (for the two-pen model illustrated above).
- both variables recorded on the same chart, but dual indicating scale calibrations that read watts and vars in the most convenient range for each.
- variables indicated and recorded on a split chart and scale . . . ideal for combining four records of watts and vars that would overlap if all appeared on the same chart.

The accurate, time-saving way to watch watts and vars is to see them on the same *ElectroniK* instrument. One instrument does the job of two . . . needs only half the panel space, half the chart paper.

You can have watts and vars recorded in the way most convenient for your particular needs. Both values can be indicated and recorded *continuously*, by a two-pen model. Or, a single-pointer instrument alternately prints watts and vars.

Either way, you're sure to profit by the accuracy, dependability, and serviceability for which *ElectroniK* instruments are famous, in power plants and industrial installations everywhere. Ask your local Honeywell sales engineer to talk over your specific application . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA:** Write for new Bulletin 9070, "Instruments for Electrical Power Generation."

H HONEYWELL

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

Argonne National Laboratory Experimental Boiling

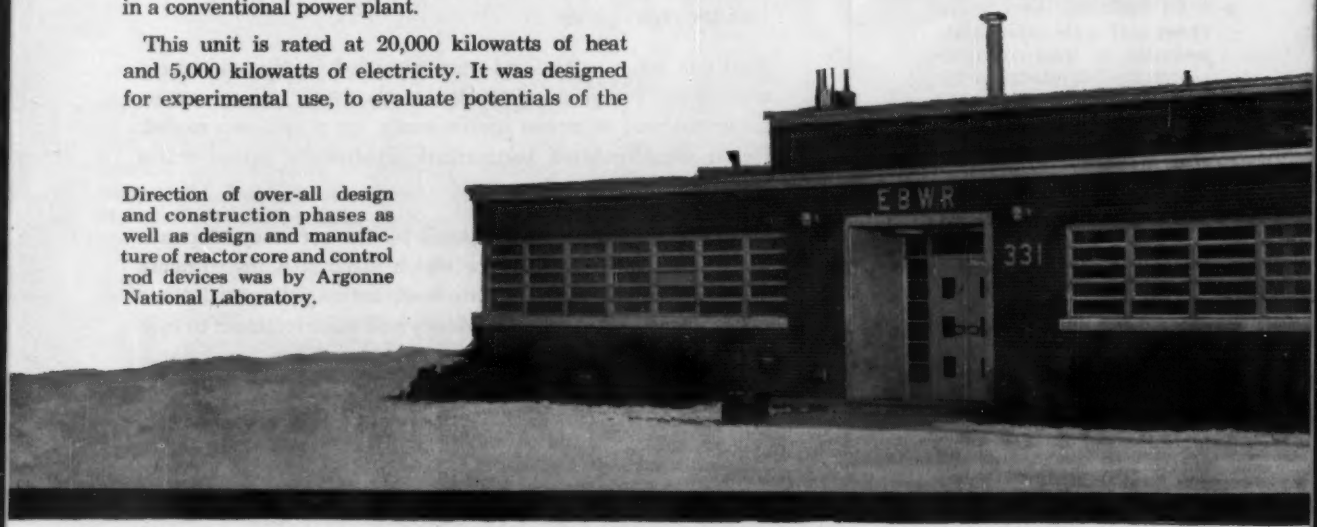
Electricity from NUCLEAR POWER TODAY!

NOW in operation at Lemont, Illinois, this is the first commercial-type power plant in the United States to generate usable quantities of electric power from nuclear fuels.

The unique feature of this boiling water reactor is that live steam is actually generated in the uranium core by nuclear heat and piped directly to the turbine without need for intermediate heat exchangers as required by other types of reactors. In effect, it operates very much like the coal-fired boiler in a conventional power plant.

This unit is rated at 20,000 kilowatts of heat and 5,000 kilowatts of electricity. It was designed for experimental use, to evaluate potentials of the boiling water reactor for large-scale commercial applications. Power generated is used by the Laboratory to meet a portion of its own electric power requirements.

Allis-Chalmers is proud of its association with this significant project. It's another example of "Engineering in Action" to provide power for better living from any source, whether it be water, steam, oil, or the atom itself.

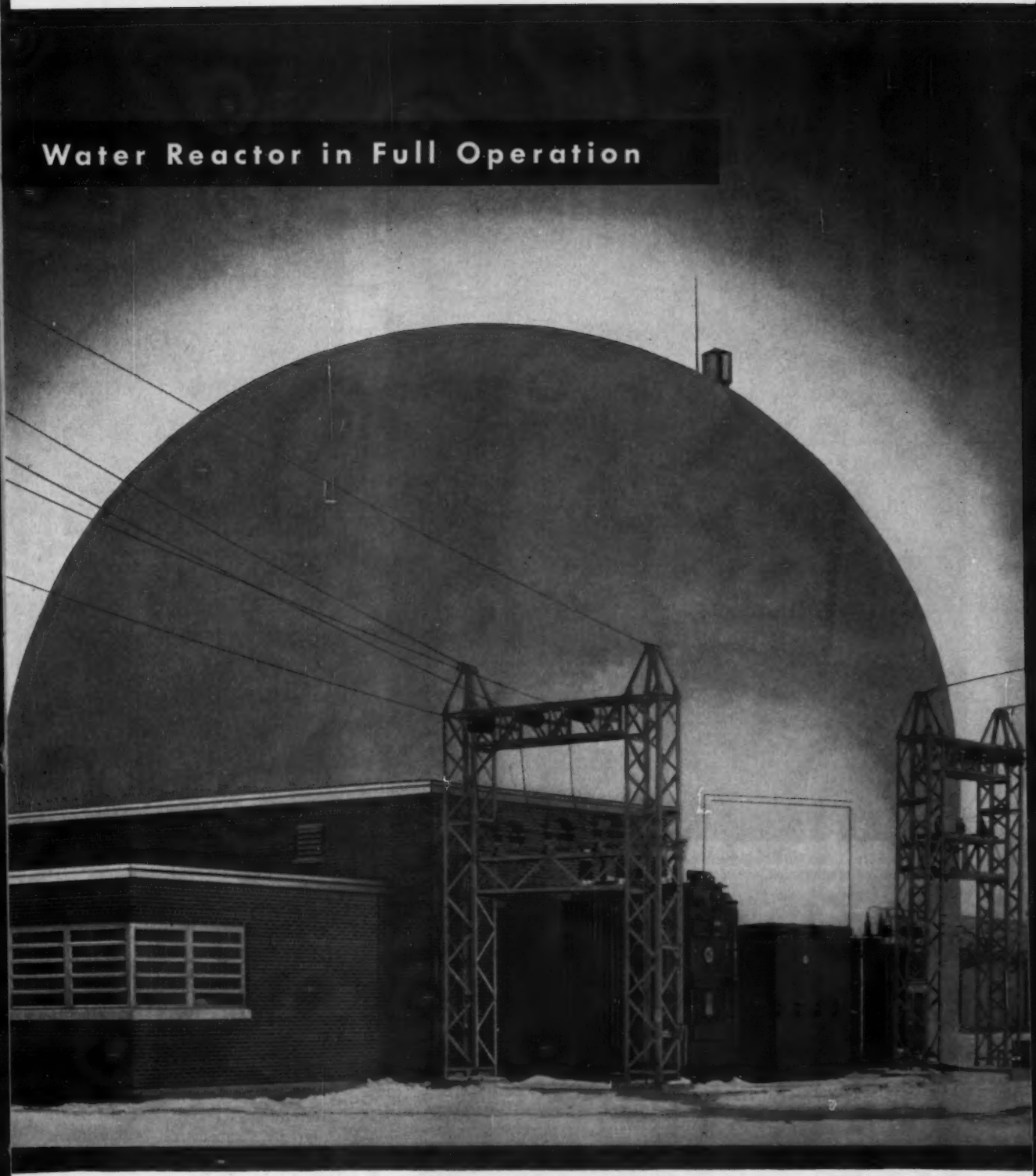


Direction of over-all design and construction phases as well as design and manufacture of reactor core and control rod devices was by Argonne National Laboratory.

Power Equipment Supplied by Allis-Chalmers

- Steam turbine generator and exciter
- Surface condenser and air ejectors
- Complete control center for remote operation of reactor and power equipment
- Reactor water recovery and air drying system
- Reactor steam bypass control system
- Hermetically sealed pumps for reactor purification system
- Reactor feedwater pumps
- Circulating water pumps
- Auxiliary cooling water pumps
- Motor control centers
- Main and reserve power transformers
- Indoor and outdoor switchgear
- Automatic voltage regulator
- Circulating water treatment system
- Ac-dc distribution center
- Diesel-generator set

NATIONAL ELECTRICAL week
FEB. 10-16, 1957

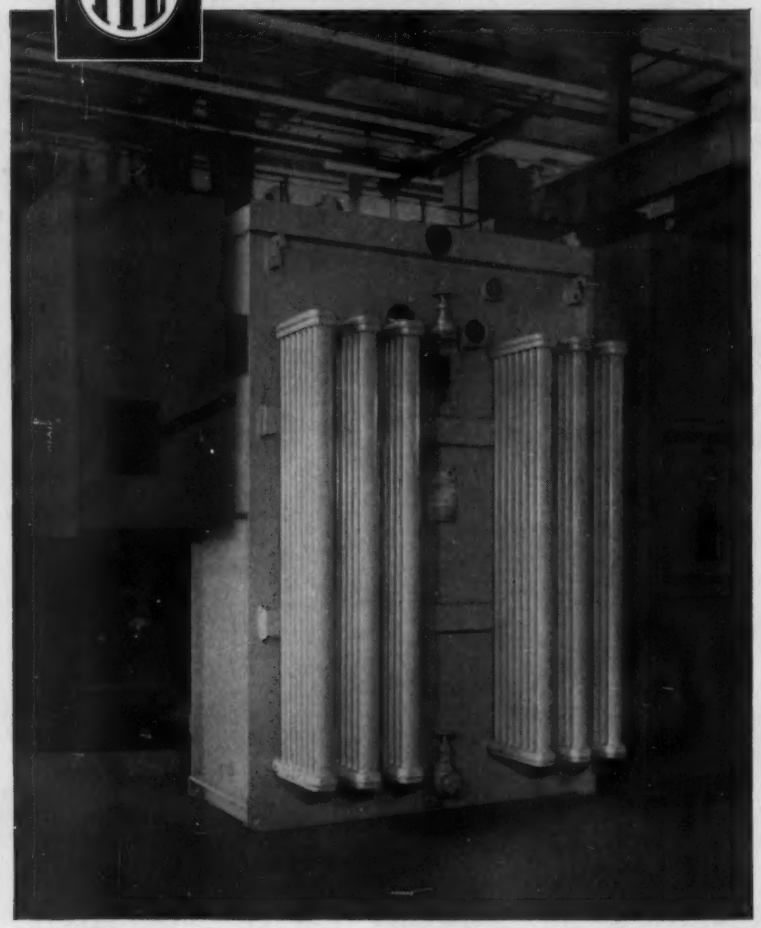


ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

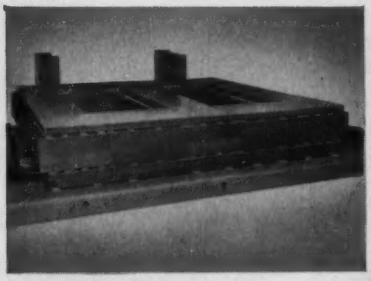
A-5344

UNIT SUBSTATION TRANSFORMERS



No leakage here. Tanks on liquid-filled transformers are double welded—inside and out. Sides and cover are reinforced. Cover is gasketed and bolted in place.

Why coils stay put. Double jackscrews in combination with tie rods between upper and lower core clamps hold coils rigidly in place, even under severe stress.



Protection against noise. High-grade oriented silicon iron laminations are stacked flat on special tables. This keeps noise level low.

Resist heaviest stresses — even from frequent short circuits

Even if you don't anticipate frequent short circuits, you still benefit three ways from the extra strength and dependability built into I-T-E transformers:

1. *Less risk of trouble in service*
2. *Virtual freedom from transformer damage due to even abnormal stresses*
3. *Greater length of service*

I-T-E's ability to give you these important extra advantages comes from many years' experience building transformers for mechanical rectifiers and other special-purpose applications where direct short circuits are an ever-present possibility. Now the same construction is offered in transformers for substation use.

I-T-E transformers are available either ventilated dry type or immersed type and in a wide range of ratings. They are manufactured complete with all standard accessories and comply fully with all industry standards. The I-T-E factory is equipped to apply all NEMA tests. Write for complete information. I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

Transformer & Rectifier Division

ELECTRICAL BUSINESS OUTLOOK

Electrical World
FEBRUARY 11, 1957

There are signs capital goods producers are riding the crest of a boom. Manufacturers of non-electric machinery are picking up new business at a rate that is handsome by standards of 1954 and the first half of 1955. But the trend of new orders since the middle of 1956 has been down. This is the picture sketched by the McGraw-Hill index of new orders for machinery. The December index stood at 128 (seasonally adjusted; 1950=100). This is well below the year's average of 146 and the third quarter average of 140.

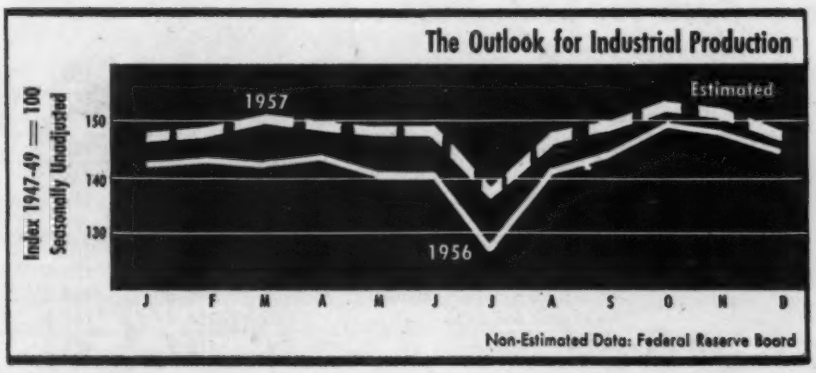
Another direction signal for capital goods demand—the McGraw-Hill index of **new contracts for industrial construction—has fallen off too.** The December index stood at 190 (not adjusted for seasonal variations; 1950=100). This is a substantial drop from the year's average of 227, and the third quarter average of 205. But it is still above December 1955.

This doesn't mean machinery output or industrial construction is on skids this year. The outlook is still strong for 1957. It takes several months to turn out most types of machinery, and many producers had a six-month backlog of work on their books at the beginning of the year. Working off current backlogs as well as the new orders that are coming in will keep industrial building contractors and machinery producers busy in 1957. But if the drop in orders continues, it may signal a slow-down in the production of capital goods late this year and in 1958.

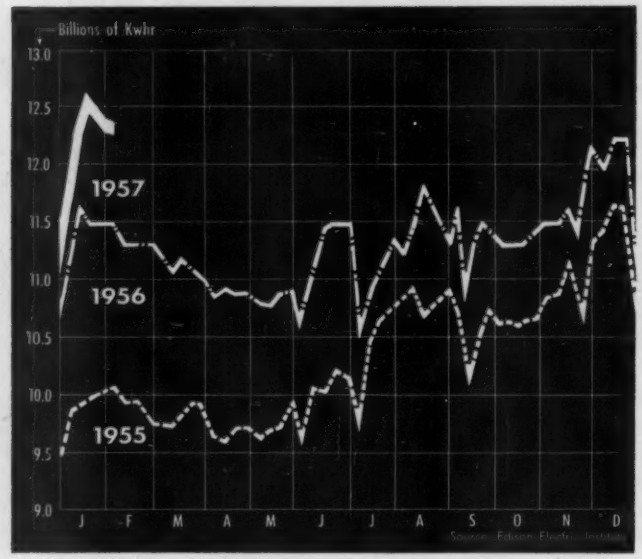
Structural steel orders are still hitting fabricating mills at a fast clip. December bookings of 404,429 tons are 10% over December 1955, and the year-end total of 4,013,186 tons is up 9% over the previous period. Shipments in December were 297,785 tons, a 20% increase over the same month in 1955. In 1956 shipments reached 3,205,488 tons, a 7% gain over the preceding year.

Look for higher steel prices by this fall. Extras are already up some 3 to 5%. Other increases are a certainty, many observers say, because of growing operating costs, the unsuccessful bid for fast tax amortization, and the scarcity of expansion money.

The 34¢ a lb price of copper may not lure many buyers into the market. They were stand-offish before Phelps Dodge Corp, Kennecott Corp, and Anaconda Co came down from 36¢. And those close to the industry see no buying upsurge in the immediate future. Steadily increasing supplies of the red metal are causing some "wait and see" reactions.



STATISTICS



OUTPUT

Week ended Feb. 2,
12,322,000,000 Kwhr
Up 6.8%

Per Cent Change From Previous Year

	Jan. 19	Jan. 26	Feb. 2
Total U. S.	+ 9.0	+ 7.8	+ 6.8
New Eng.	+ 9.9	+ 6.5	+ 4.3
Mid Atlantic	+ 7.6	+ 4.8	+ 4.5
Cent. Ind.	+ 8.4	+ 5.9	+ 6.0
West Cent	+10.6	+ 8.7	+ 9.9
Southeast	+ 8.2	+ 7.4	+ 4.8
South Cent.	+11.9	+11.5	+11.6
Rocky Mount.	+ 9.3	+12.8	+10.3
Pacific			
NW	+14.6	+16.8	+ 9.2
SW	+ 7.0	+ 9.0	+11.1

Seasonally Adjusted Index 230.4
Week Ago 227.8
Year Ago 214.5

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 7.3%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Nov.	119.91	119.38	113.55	5.6
Peak—Class 1 Systems.	Oct.	101.2	96.6	96.5	4.9
Estimated Dec. '56 Peak (million kw)	Nov.	106.2	106.2	104.5	1.6
Estimated Dec. '57 Peak (million kw)	Nov.	114.8	114.8	111.6	2.9
Production—billion kwhr	Nov.	50.65	51.13	47.78	6.0
Hydro		9.31	9.24	9.24	0.8
Fuel		41.34	41.89	38.54	7.3
Sales—billion kwhr	Nov.	45.78	45.98	42.96	6.6
Residential		11.66	11.27	10.74	8.6
Commercial		7.20	7.37	6.61	8.9
Industrial		24.51	24.79	23.28	5.3
Other		2.41	2.56	2.33	3.4
Fuel Consumption	Nov.				
Coal—million tons		14.03	13.52	13.31	5.4
Oil—million barrels		7.13	6.27	7.11	0.3
Gas—million cu ft		88.73	114.36	81.75	8.5
Net Income Class A & B Co's—$ million	Nov.	102.54	95.79	102.79	−0.2
Residential Customers—millions	12 mos.	45.62	45.49	44.30	3.0
Revenue per kwhr	ended	2.60¢	2.60¢	2.65¢	−1.9
Avg kwhr per customer	Nov. 30	2,956	2,942	2,728	8.4
Avg annual bill		$76.86	$76.49	$72.29	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Nov.	149	150	144	3.5
ENR Construction Cost	Jan.	148.4	147.6	141.8	4.7
BLS Cost-of-living	Dec.	118.0	117.8	114.7	2.9
New Orders for Machinery (1950 = 100)	Nov.	140	139	143	−2.1
NEMA Sales					
Insulation materials	Nov.	149	163	155	−3.9
Electric appliances		81	94	88	−8.0
Wholesale prices	Nov.				
Motors and generators		140.1	136.9	127.0	10.3
Transformers and regulators		146.6	144.8	129.2	13.5
Switchgear and fuses		164.4	161.9	145.9	12.7
GNP—annual rate—$ billion	3rd Qtr.*	413.8	408.3	396.8	4.3

MANAGEMENT BULLETIN

FINANCE

New security offerings by electric utilities slowed down last week. The only issue offered was the one won by Halsey, Stuart & Co of $12 million Public Service Co of Oklahoma first mtge 4¼% bonds (Aa) due 1987 with a bid of 98.45%; reoffered at 99.25% to yield 4.29%. Issue is going "fairly well."

Philadelphia Electric Co ups quarterly common stock dividends to 50¢ a share as compared with 45¢ a share in the previous quarter.

Kendallville, Ind., City Council decides to keep its electric properties. It rejected an offer of the Indiana & Michigan Electric Co to buy the city-owned facilities for $1,181,500. Three councilmen favored the sale while only two opposed it. Indiana law requires four out of five votes (two-thirds majority) if a municipal utility is to be sold.

Memphis, Tenn., officials get check covering sale of $163,245,000 bonds recently. Harry D. Allen, bond executive of Merrill Lynch, Pierce, Fenner & Beane at Memphis, said that these electric revenue bonds are still just about the cheapest buy in the bond market. This despite the fact they have increased about $60 per $1,000 bond in value since originally sold, he said. Since the issuance on Dec. 13, the entire issue has increased in value by some $9 million, Allen indicated.

International Hydro-Electric System gets clearance from the U. S. Supreme Court to become an investment company to be known as Abacus Fund.

Nesbitt, Thomson & Co group is offering $40 million British Columbia Electric Co first 5% mtge bonds due 1982 at 93.25% to yield 5½%. Bonds cannot be redeemed before 1977.

Stockholder subscriptions are going well. Niagara Mohawk Power Corp's stockholders took $44,280,400 of $46,224,200 of 4⅝% convertible debentures offered on the basis of $100 deb for each 25 shares at $100. Balance $1,943,800 was sold by the underwriting group headed by Harriman Ripley & Co . . . Southwestern Public Service Co says subscriptions received on its offering of 291,967 shares to common stockholders and employees amounted to 134% of the issue.

Pacific Power & Light Co asks Wyoming Public Service Commission for authority to provide service to four townships in a rural area south and east of Laramie. Territory lies adjacent to area formerly served by Western Public Service Co which PP&L acquired more than a year ago.

LEGISLATION

Wyoming legislature gets bill which would prohibit "a public utility, engaged in the sale or furnishing to or for the public of electricity or gas, from using any portion of its utility plant, property, facilities or utility employees for the purpose of operating or conducting a retail or wholesale merchandising business." . . . To aid in attracting new industry, Idaho legislature gets bill which provides that electricity generated or sold for use within the boundaries of Idaho for manufacturing, mining, milling, smelting, refining, and processing would be exempt from the ½-mill per kwhr tax . . . Arkansas legislature receives bill which will prohibit public utilities furnishing electric, gas or water from making a charge for disconnecting service unless the meter actually is disconnected and removed, or to charge for connecting service if the meter does not have to be installed.

An REA-sponsored bill to tax all electric utilities on the basis of revenue per mile of transmission line was passed, 48-8, by the Wyoming house. Bill would supplant the ad valorem taxation on electric utilities. Bill's backers maintained that because of the low density of population per mile on transmission lines, REAs are taxed higher than private utilities. The 1955 Wyoming legislature removed

all tax exemptions previously given REA's, subjecting them to property taxation for the first time.

REGULATION

Higher rates for all classes of service are in store for Western New York area if PSC approves, Niagara Mohawk Power Corp reveals. Disclosure that a new rate schedule for all kinds of 60-cycle service will soon be filed by NMP brought an abrupt postponement of a PSC hearing on higher 25-cycle rates. There is no indication of the amount of increase that would affect Buffalo.

A service to improve the speed and accuracy of rate analyses for utility companies is described in a booklet entitled, "The One Step Method of Bill Analysis." It is published by Recording & Statistical Corp and a copy can be obtained by writing T. G. Campbell, vice president, at 100 Sixth Ave, New York 13.

Wisconsin Public Service Corp will reduce electric rates by $315,000 annually on service bills issued on and after Feb. 18. PSC has approved it.

YOUR HEALTH

Shingles

REX H. WILSON, MD, Medical Director, The B. F. Goodrich Co

One of the more painful diseases of mankind is shingles, which is medically known as Herpes Zoster. Small blisters appear in a localized line-like formation on the skin, and the whole surrounding area is quite sore.

Herpes Zoster is caused by a virus that is closely related to the virus of chicken pox. It causes an acute infection of the central nervous system especially involving one of the superficial nerves of the body. One or more of these nerves becomes affected, and blisters resembling chicken pox appear in localized areas on the skin over the nerve.

Herpes Zoster is most frequent in males over 50 years of age. It can be due to exposure to a person who has chicken pox. It can appear as a complication of poisoning with carbon monoxide, arsenic, or bismuth. Sometimes a patient with pneumonia, tuberculosis, Hodgkin's disease, or severe kidney disease develops shingles. Lesions in the vicinity of the spine such as fractures, cancers, syphilis, or other infections can activate the virus and cause shingles to appear.

Usually Herpes is preceded by chills, fever, weakness, nausea, and vomiting for three or four days with or without pain along the site of the future eruption. Then the blisters appear on the skin along the distribution of the affected nerve. The usual site is about the chest and the spread is on one side only. About the fifth day after their appearance, the vesicles begin to dry and scab. The pain in the affected area may be quite severe and persist for months to years. One attack of shingles usually confers an immunity.

Herpes also may occur on one side of the face affecting the ear, the inside of the mouth or the eye. It may cause a facial paralysis or permanent damage to the affected eye from ulceration.

Most patients recover without any residual defects except for scarring of skin. Pain may persist for years. Facial paralysis almost always disappears.

There is no specific treatment. Boric acid or zinc oxide powders may be dusted on the blisters and covered with a soft dry dressing. Collodion dressings or tincture of benzoin are frequently helpful. Your physician may give you injections of Vitamin B_{12} or one of the cortisone derivatives. Aspirin may relieve the pain, but codeine is sometimes necessary. A nerve block may be required in the severe cases. When the eye is involved, your physician will make every effort to protect it by using medicated drops and an eye pad.

Treatment of persisting pain after the shingles have disappeared is difficult. Aspirin does not always help, and morphine should not be used. X-ray therapy to the affected nerve and spinal cord may be effective. Sometimes when pain persists, it may be necessary to cut the nerve or a portion of the spinal cord.

Man is plagued with all kinds of aches and pains from so many causes. It is little wonder that he stands in awe of his body. It can hurt so much—but it can feel so good, too.

where **POWER** is **VITAL**

ASCO AUTOMATIC TRANSFER SWITCHES help insure the safety of New York's subway millions

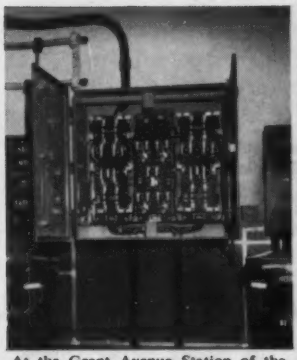
More than 4½ million commuters use the New York City subway system daily during the working week. Their safety is a major concern of the New York City Transit Authority. That is why the NYCTA insures against power failure with stand-by power. When normal power fails, ASCO Automatic Transfer Switches automatically transfer the load to the emergency source.

The Transit System's new and modern station at Grant Avenue in Brooklyn, N. Y., is typical. There ASCO switches assure continuous adequate-voltage power for a wide range of equipment: train signals, safety devices, station lighting, ventilation and drainage.

Dependable Control by ASCO

Wherever power and dependability are vital, ASCO switches provide these notable advantages: *continuous duty rating* in either normal or emergency position . . . *capacity* to withstand inrush currents 20 times full load rating . . . *rated* 750 volts A-C or D-C . . . *mechanical locking* to safeguard against vibration and electromagnetic effects . . . *single coil design* . . . *built-in time delay* so that equipment ignores harmless momentary outages . . . *full phase protection*, high thermal capacity, and many other design features and accessories. That is why safety-minded engineers specify ASCO – the one source for a full line of dependable automatic transfer switches. Write for Publication 596 on how to select an adequate automatic transfer switch.

Critical Subway equipment depends on continuity of adequate voltage power



At the Grant Avenue Station of the NYC subway system, this electrical distribution room features ASCO Transfer Switches which "throw in" emergency power for station and tunnel lighting and safety devices.

Safety trip which prevents train from passing through red lights relies on ASCO switch for emergency power.

Automatic Switch Co.
50-P Hanover Road, Florham Park, N. J.

ASCO

MEETINGS CALENDAR

FEBRUARY

National Electrical Week—Second Annual Observance, Feb. 10-16.

Edison Electric Institute—Electrical System & Equipment Committee, Somerset Hotel, Boston, Mass., Feb. 11-12; Residential Lighting Committee, Cincinnati, Ohio, Feb. 11-13; Commercial Cooking & Water Heating Committee, Tutwiler Hotel, Birmingham, Ala., Feb. 14-15; Residential Promotion Committee, New York, N. Y., Feb. 14-15.

Pennsylvania Electric Association—Communications Committee, Hotel Americus, Allentown, Pa., Feb. 11-12; System Planning Committee and Systems Operation Committee, Benjamin Franklin Hotel, Feb. 14-15; Relay Committee, Roosevelt Hotel, Pittsburgh, Pa., Feb. 28-Mar. 1.

Electric Institute of Washington—Electrical Trade Conference and Exposition, Shoreham Hotel, Washington, D. C., Feb. 12-14.

National Electrical Manufacturers Association—General Purpose Control Subcommittee, Advisory Committee, Industrial Control Section and Industry Control Subcommittee, Advisory Committee, Industrial Control Section, Feb. 13; Electronic Control Subcommittee, Advisory Committee, Industrial Control Section and Standards Committee, Advisory Committee, Industrial Control Section, Feb. 14—all being held at NEMA Headquarters, 155 East 44th St., New York, N. Y.

American Institute of Electrical Engineers—1957 Transistor & Solid State Circuits Conference, sponsored jointly with Institute of Radio Engineers and University of Pennsylvania, Philadelphia, Pa., Feb. 14-15.

American Public Power Association—First Engineering and Operations Workshop, Springfield, Mo., Feb. 14-15.

National Society of Professional Engineers—Spring Meeting, Hotel Francis Marion, Charleston, S. C., Feb. 15-16.

Cleveland Electronics Conference—Masonic Auditorium, Cleveland, Ohio, Feb. 15-16.

National Adequate Wiring Conference—13th Annual Discussion, Sherman Hotel, Chicago, Ill., Feb. 21-22.

North Central Electrical League—20th Annual Upper Midwest Electrical Industry Convention, Leamington Hotel, Minneapolis, Minn., Feb. 24-27.

American Society of Heating and Air-Conditioning Engineers—63rd Annual Meeting, Chicago, Ill., Feb. 25-28; 13th International Heating and Air-Conditioning Exposition, Chicago, Ill., Feb. 25-Mar. 1.

Institute of Radio Engineers—Western Joint Computer Conference, Hotel Statler, Los Angeles, Calif., Feb. 26-28.

Electrical Equipment Representatives Association—Annual Meeting, St. Anthony Hotel, San Antonio, Tex., Feb. 27-Mar. 2.

Pacific Coast Electrical Association—Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif., Feb. 28-Mar. 1.

MARCH

Southern Safety Conference—John Marshall Hotel, Richmond, Va., Mar. 3-5.

National Rural Electric Cooperative Association—Annual Meeting, Conrad Hilton Hotel, Chicago, Ill., Mar. 4-7.

Louisiana State University—Annual Conference on High-Speed Computers, Baton Rouge, La., Mar. 5-8.

Street Tree and Utility Conference—Hotel Cleveland, Cleveland, Ohio, Mar. 7-8.

1957 Nuclear Congress (Coordinated by Engineers Joint Council)—2nd Nuclear Engineering and Science Conference; 3rd International Atomic Exposition, and 5th Hot Laboratories and Equipment Conference, Convention Hall, Philadelphia, Pa., Mar. 11-15.

Electric Companies Public Information Program—Inter-Regional Committee, New York, Mar. 12; Steering Committee, New York, Mar. 14.

National Electrical Manufacturers Association—General Engineering Committee, Switch and Enclosed Breaker Section, Chase Hotel, St. Louis, Mo., Mar. 13; Panelboard and Distribution Board Section, Molded Case Breaker Section and Busway Section, Chase Hotel, St. Louis, Mo., Mar. 14.

• **National Industrial Conference Board**—5th Atomic Energy in Industry Conference, Ben Franklin Hotel and Convention Hall, Philadelphia, Pa., Mar. 14-15.

American Society of Mechanical Engineers—Gas Turbine Conference, Sheraton-Cadillac Hotel, Detroit, Mich., Mar. 18-21; Engineering Management Conference, William Penn Hotel, Pittsburgh, Pa., Mar. 27-28.

Edison Electric Institute—Industrial Relations Committee, EEI Headquarters, New York City, Mar. 21.

• **American Power Congress**—19th Annual American Power Conference, Hotel Sherman, Chicago, Ill., Mar. 27-29.

Electric Meter Institute—Eighth Annual Session, University of Denver, Denver, Colo., Mar. 25-29.

Oklahoma Utilities Association—Annual Convention, Hotel Tulsa, Tulsa, Oklahoma, Mar. 28-29.

• **Illuminating Engineering Society**—Pacific Northwest Regional Conference, Empress Hotel, Victoria, B. C., Canada, Mar. 28-30.

APRIL

• **Edison Electric Institute**—Industrial Power and Heating Committee, Edgewater Beach Hotel, Chicago, Ill., April 1; Sales Conference, Edgewater Beach Hotel, Chicago, April 1-4; Accounting Division Advisory and Executive Committee, Madison Suite, Sheraton Park Hotel, Wash., D. C., April 8; National Accounting Conference of Electric & Gas Utility Accountants, held jointly with AGA, Washington, D. C., April 8-10; Industrial Relations Committee, jointly with Personnel Sections of Indiana Electric Assn and Ohio Electric Utility Institute, and Personnel Practices Committee of Pennsylvania Electric Assn, Netherland Plaza Hotel, Cincinnati, Ohio, April 18-19; Meter and Service Committee, Soreno Hotel, St Petersburg, Fla., April 24-26; Purchasing and Stores Committee Executive Committee and 10th Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Pa., April 28-May 1; Accident Prevention Committee, Algiers Hotel, Miami Beach, Fla., April 29-May 1.

Southeastern Electric Exchange—24th Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., April 1-2.

National Industrial Conference Board—8th Atomic Energy Courses for Management, Westchester Country Club, Rye, N. Y., April 1-6.

Indiana Electric Association—17th Annual Young Men's Utility Conference, Terre Haute House, Terre Haute, Ind., April 3-4.

• **Missouri Valley Electric Association**—Engineering Conference, Hotel President, Kansas City, Mo., April 3-5.

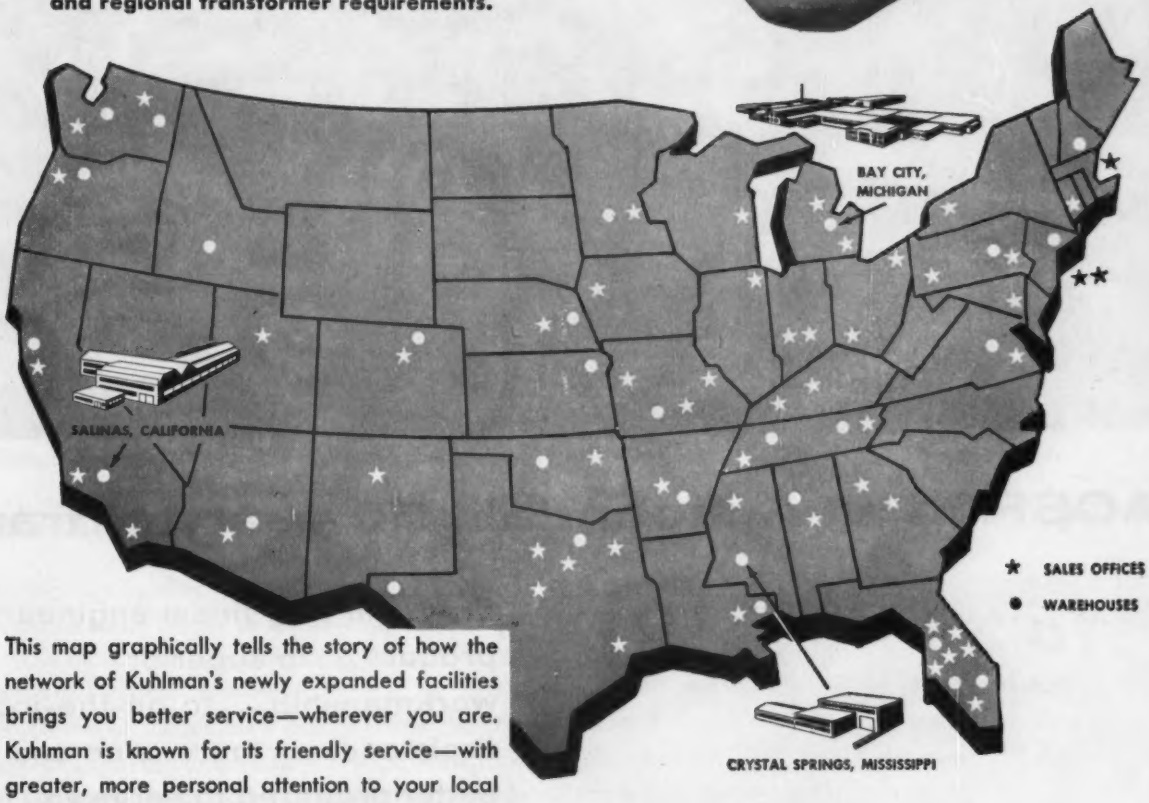
• Additions this week.

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify dept. SA-1, Kuhlman Electric Co., Bay City, Mich., you will receive a valuable gift certificate. Each week a different Kuhlman representative is featured . . . watch for the next Kuhlman "Salesman of the Week."

"WE'LL SERVE YOU BETTER . . . WHEREVER YOU ARE"

Kuhlman's 3 Regional Factories . . . 55 Sales Offices . . . 29 Distributing Centers are strategically located to meet your national and regional transformer requirements.



This map graphically tells the story of how the network of Kuhlman's newly expanded facilities brings you better service—wherever you are. Kuhlman is known for its friendly service—with greater, more personal attention to your local and regional requirements. It is this type of service that helps create the ever-increasing demand for Kuhlman transformers. Ask your friendly Kuhlman representative about the new Kuhlman facilities in your area.

576c

KUHLMAN

ELECTRIC COMPANY

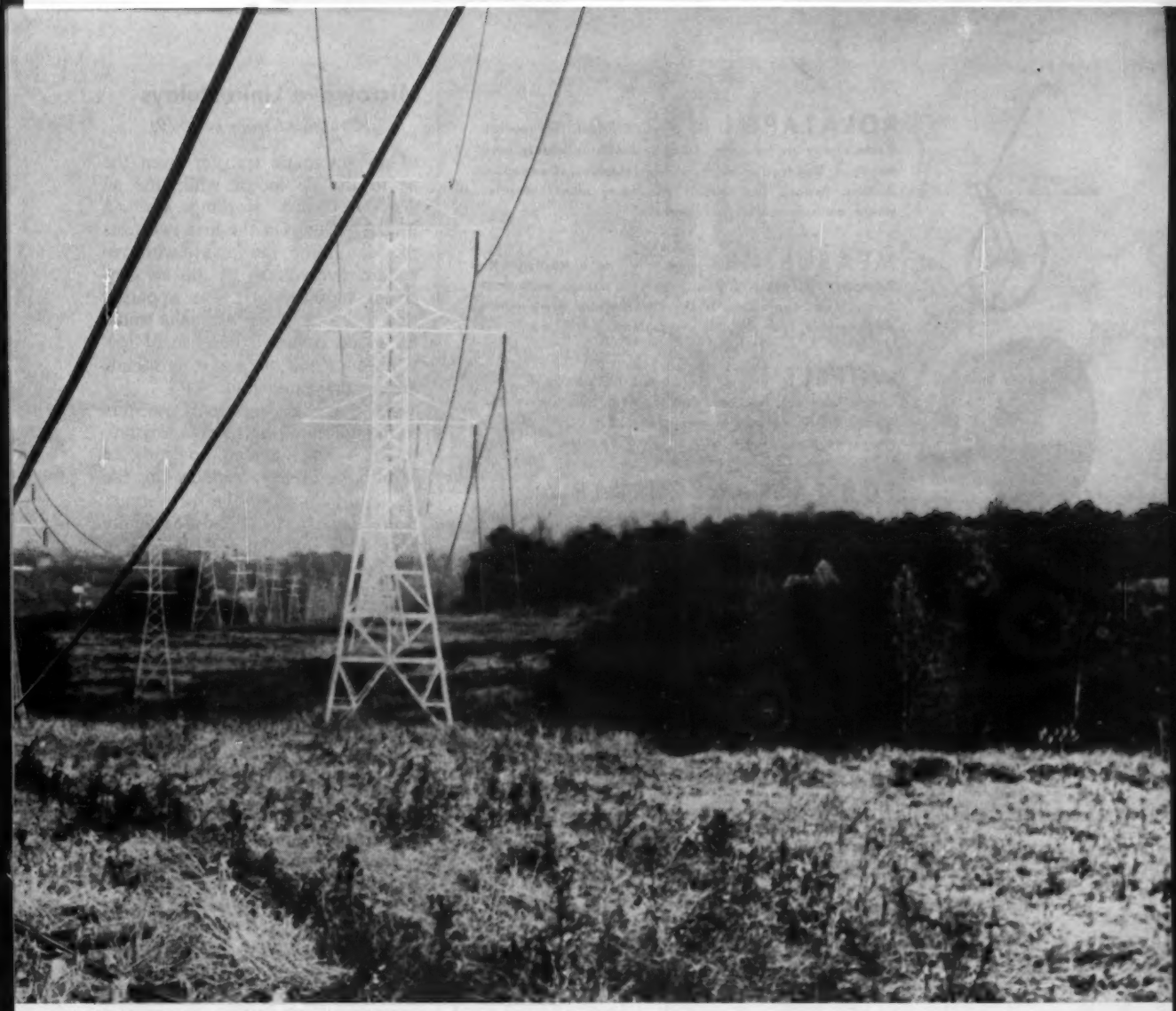
BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

ANACONDA ACSR was installed over large segment of Duke Power Company's 75-mile,

ACSR? Put Anaconda's 50 years of trans-

From the very finest engineered product . . . to superior workmanship . . . to on-the-job assistance . . . there is no one better prepared to serve you today with ACSR than Anaconda.

UNIQUE THREE-REEL TRUCK was used to install cable—795 Mcm, 26/7 ACSR from Anaconda. Three reels at once sped work.



230KV Riverbend-Tiger Line. Here, you look west of Kings Mountain, S. C.

mission cable experience to work for you

Producing top quality transmission cable requires more than a ready supply of metal—copper or aluminum. The most vital ingredient of good cable is the manufacturer's *cable experience.*

The choice of metals may change, depending on economic or other considerations. But cable requirements and the skills and knowledge involved in making dependable transmission lines do not. Whether copper or aluminum . . . it will pay you to call on the Man from Anaconda.

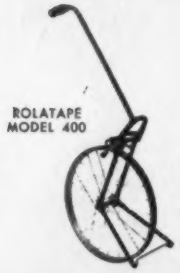
Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs.

Multi-mill manufacturing facilities – strategically located across the country – assure speedy service. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

P.S. TECHNICAL ASSISTANCE. Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem.

Ask the Man from ANACONDA®

for ALUMINUM WIRE & CABLE



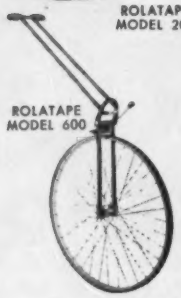
ROLATAPE is the Fast, Efficient, Economical, Modern way to measure. Model #400 is widely used by Road Construction Companies, Telephone Companies, Utilities, Sewage Departments and many other industries where measurements are important.

MEASURING time is cut to a fraction with Rolatape. Model #200 is extremely popular with Real Estate Men, Appraisers, Traffic Officers and many others who demand fast, accurate, measurements.

WHEELS on all Rolatapes are precision calibrated, and can be depended upon for long-life service. Model #600 is a special model for long-distance, acreage measuring and for use over rougher terrain.

ROLATAPE
MODEL 200

FOR FAST, ACCURATE measuring—Rolatape Measuring Wheels are the answer. Models #400 and 600 measure distances up to nearly nineteen miles.



MEASURING is simple, time-saving, and efficient when you use a Rolatape. FOR COMPLETE DETAILED ROLATAPE INFORMATION, SEE YOUR DEALER, DISTRIBUTOR, OR WRITE TO:

ROLATAPE, INC.
Factory: 1741 Fourteenth Street, Santa Monica, California

NOW DO MORE WORK WITH ANY LINE TRUCK

GREATEST OPERATING RANGE OF ANY PINLESS DERRICK

SINGLE CYLINDER—PISTON ROD TOTALLY ENCLOSED

POSITIVE LOAD CONTROL IN ALL POSITIONS

NO CENTER LEG IN FLOOR

EASILY MOUNTED ON ANY TRUCK

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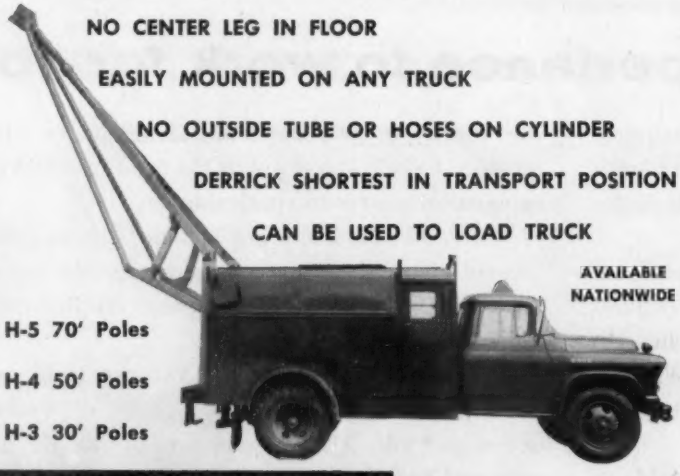
DERRICK SHORTEST IN TRANSPORT POSITION

CAN BE USED TO LOAD TRUCK



AVAILABLE NATIONWIDE

H-5 70′ Poles

H-4 50′ Poles

H-3 30′ Poles

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MANUFACTURERS
PORTLAND, ORE. • OAKLAND, CALIF.

HYDRAULIC DERRICKS • ALL ELECTRIC HALL AERIAL LADDERS • UTILITY MAINTENANCE AND CONSTRUCTION BODIES AND HALL HYDRAULIC AND MECHANICAL EARTH BORERS

Microwave Links Relays

(Continued from page 79)

of an automatic transfer from the ac to the dc motor while the ac generator was working into a dummy load. On the first two tests the dc motor ran away with resultant overvoltage at the ac generator terminals. It was apparent that this took place when the transfer to dc occurred because of low voltage at the ac motor terminals during the cable fault.

As tests were repeated, transfers to the dc motor were made satisfactorily. This tended to indicate trouble in relay contacts in the dc motor's speed-control circuit. Both user and manufacturer finally concluded that the trouble was in the contact of a vertical-lift, industrial-type relay in the speed control circuit. This was the only relay in the control cabinet whose contacts were in a horizontal plane and had no wiping action. The relay had remained energized for a long time and the back contacts, which are the dc speed control circuit, had a chance to collect dust and thus result in faulty operations.

A relay is being added to switch the microwave equipment to station service in event the microwave supply voltage exceeds a predetermined value. On loss of the normal station service supply to the microwave equipment there is an automatic transfer to a duplicate source for this equipment.

The present overall reliability of the system is 99.98%. Reliability of the primary system itself is 99.62%. In this application the installation of stand-by equipment has increased overall system reliability 0.36%.

POWER BRIEFS

Plans to double the size of its $13-million 65,000-kw plant now under construction at Cohasset, Minn., have been announced by **Minnesota Power & Light Co.** The second 65,000-kw unit, planned for operation by the end of 1959, will cost $12 million.

Hydro-Quebec has finally selected the Lachine rapids as its site for a new multi-million dollar hydroelectric development on the St. Lawrence River.

Are you MISSING something in Electrical World?

We will guarantee that nowhere else in the industry will you find the wealth of selective, timely, downright useful information assembled each week in Electrical World's Management Newsletter, the back-of-the-book, yellow-stock insert. If you aren't already familiar with it, let's get acquainted . . .

Leading off is the Electrical Business Outlook, a condensed, penetrating examination from the utility management standpoint of what is important, in or affecting this industry. The statistical picture complete with power sales, output, power and general business statistics will be found here, together with the latest hot news on Finance, Rates, Taxes, and Advertising and Public Relations. Top this all off with the readable, personal Your Health feature, and you'll find it's easy, as well as smart, to keep informed on your industry the Electrical World way, through . . .

"The Electrical Industry's Weekly Magazine"

Just 4 Simple Steps to Install

ALLIS-CHALMERS Core and Coil Replacement Assemblies

1. Attach brackets on top and bottom of side frame, using bolts in frame. If old anchoring studs or lugs are not already suitably located in tank wall, weld new ones in position.

2. Position core and coil assembly over tank. Adjust expandable bottom brackets to meet side of tank wall to assure accurate fit.

3. Lower assembly into tank and adjust top brackets to meet lugs in side wall. Anchor in place.

4. After cutting leads to required length, braze the terminals to the leads (all leads and terminals are identified).

You can use Allis-Chalmers replacement units in any type transformer tank. They are packaged for convenience, immersed in oil in specially designed containers, which protect against moisture or damage during transportation. You get complete instructions with each unit.

Assemblies available in ratings 25 kva and smaller, 15 kv and below, and conform strictly to NEMA standards. Use them in either conventional or protected types. Provision for mounting low voltage breaker, and a winding to operate signal light are standard.

★ ★ ★

GET ORIGINAL FACTORY QUALITY. Call your nearby A-C office for information. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 61B6345A.

A-4884

ALLIS-CHALMERS

There's one In Every Crowd . . .

But in this case, only one! Engineers and executives in all phases of the complex electric power industry prefer ELECTRICAL WORLD 4 to 1 over any other industry magazine. This overwhelming preference has been borne out year after year in independent surveys conducted by advertisers over their own customer and prospect lists.

F & H Self-Powered **HOLE DIGGER**

The modern way to dig holes. No expensive installation. Fits on any A frame. Equipped to dig holes 8' deep and up to 20" in diameter. One man operates digger as all controls are mounted on machine. Available in 8-HP and 14-HP models. Auger is cleaned by spinning. Digs anchor holes with ease. Write for full information. Film of machine in operation available on request.

Manufactured by
FOUSHEE & HECKENDORN
P. O. BOX 65,
CEDAR POINT, KANSAS

Personal Briefs

(Continued from page 124)

Electrical Manufacturers Credit Group (Eastern Division) of the National Association of Credit Men has elected the following: **Sidney Wolberg,** Burndy Engineering Co, chairman; **Harold J. Langhans,** Anaconda Wire & Cable Co, vice chairman. These have been made committee-men: **John T. Carroll,** Corey Co, Inc; **Charles Cohen,** Hatfield Wire & Cable Co; and **Stanley Elmer,** Columbia Cable & Electric.

General Electric Co's medium transformer department has appointed **G. P. Vest** as manager of marketing . . . **A. E. Peltosalo** and **E. E. Bauer** have been named general managers of two newly created product sections in the capacitor department, small capacity and electrolytic section, respectively . . . GE's high voltage switchgear department, Philadelphia, has appointed **W. M. Anthony** as manager-manufacturing.

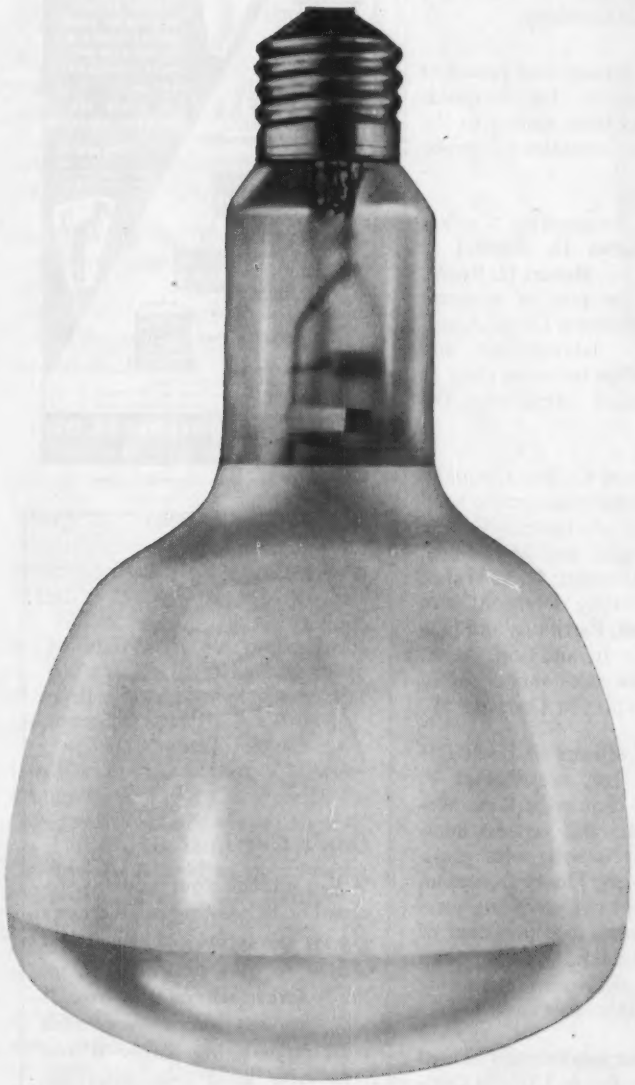
Sylvania Electric Products, Inc, has announced the following appointments in its microwave tube laboratory: **Louis H. La Forge, Jr,** manager of engineering; **Daniel H. Goodman,** manager of research and advanced development; and **Lefler H. McKee,** manager of product design and development . . . **Merle W. Kremer** is new general manager of Sylvania's Parts Division . . . Lighting Division has named **Paul F. Cemeron** as manufacturing manager-special products . . . **Adolph A. Weeks** has assumed the newly created post of plant manager of the division's starter and coil plant.

Westinghouse Electric Corp's Lamp Division has advanced **O. Bruce Goldsmith** to manager of engineering, large lamp department; **Frank J. Camarata,** manager of manufacturing, miniature lamp department; and **Raymond J. Stefany** to incandescent lamp manager, commercial engineering section . . . Recently appointed to management posts in Westinghouse's reorganized East Pittsburgh component were **S. J. Merriman,** assistant general manager of component products and printing and publications departments; **M. H. Hobbe,** assistant to the vice president; **Landon Fuller,** as-

(Continued on page 142)

Announcing the new General Electric

WHITE MERCURY LAMP



YOU and your customers can use the new General Electric *White Mercury* Reflector Lamps *in existing 400-watt mercury equipment* with no change or added investment in operating equipment.

1 GET UP TO 63% MORE LIGHT ON WORK FROM PRESENT FIXTURES: Because a brand new phosphor generates more white light than ever before you get from 7% to 63% more light on the work, depending upon the lamp type being replaced. (See below).

2 GET UP TO 33% LOWER COST OF LIGHT IN EXISTING INSTALLATIONS: With this increased efficiency, unit cost of light can go down from 7% to 33% (See below)!

3 GET LOWER INITIAL COST FOR NEW INSTALLATIONS: You can get *more* light from the same number of fixtures, or get *equal* light with up to ⅓ *fewer* fixtures!

All this is possible with new General Electric *White Mercury* Reflector Lamps because of a specially designed strontium magnesium orthophosphate phosphor. This phosphor converts ultra-violet radiation into more white light than ever possible before. It's also an efficient reflector—sealed in against dirt and fumes.

You and your customers can gain these advantages *now* by replacing present mercury lamps with the new G-E H400 RW-1. Also available in the bulged tubular shape, the H400 EW-1. For more information write: General Electric Large Lamp Dept. EW-2, Nela Park, Cleveland 12, Ohio.

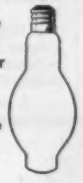
ADVANTAGES OF NEW G-E *WHITE MERCURY* OVER OTHER G-E 400-WATT MERCURY LAMPS

NEW RW-1 vs A-1 (clear glass)

- 55% to 63% more light to the work
- 27% to 33% lower cost of light
- Less maintenance
- Whiter "Color"

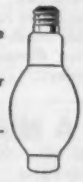
NEW RW-1 vs E-1 (clear glass)

- 28% to 31% more light to the work
- 16% to 23% lower cost of light
- Less maintenance
- Well suited for use in upward light fixtures
- Whiter "Color"



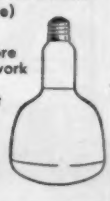
NEW RW-1 vs J1 (color improved)

- 37% to 40% more light on the work
- 24% to 30% lower cost of light
- Less color improvement



NEW RW-1 vs RC1 and R1 (reflector shape)

- About 7% more light on the work
- 7% lower cost of light
- Less color improvement for RC-1 users



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High Capacity

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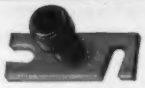

Write for Bulletin 81

CAT. NO. 5612
Wire Cap. #6 to 1/0
CAT. NO. 5622
Wire Cap. #2 to 4/0

Test links interchangeable with service links, duplex screws on line side, solderless lugs with new type patented wire stop, barriers suitable for either side and extend 1/4" over all live parts, large mounting holes in heavy duty molded base.

All features that insure easier, quicker installation and trouble-free performance.

METER DEVICES COMPANY
1001 PROSPECT AVE., S. W.
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Signs along the lines of *Crapo* **GALVANIZED STEEL STRAND PERFORMANCE**

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber—Today!

INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

sistant general manager, switchgear apparatus departments (including assembled switchgear and devices, power circuit breaker, distribution apparatus, and porcelain products departments), and carrier-microwave department; **P. C. Smith,** assistant general manager, power apparatus departments (large rotating apparatus, rectifier and traction equipment, and mica products departments); **L. A. Kilgore,** director of engineering; and **W. E. Eargle,** director of manufacturing.

Ken Johnson, former vice president of public relations for Reynolds Metals Co, has been named to the new post of vice president for public affairs.

Pacific Coast Engineering Co has appointed **Charles H. Zweifel** as chief engineer . . . **Robert H. Brown** has assumed the post of assistant director of Aluminum Co of America's research laboratories and **Charles J. Walton** becomes chief of Alcoa's Chemical Metallurgy Division.

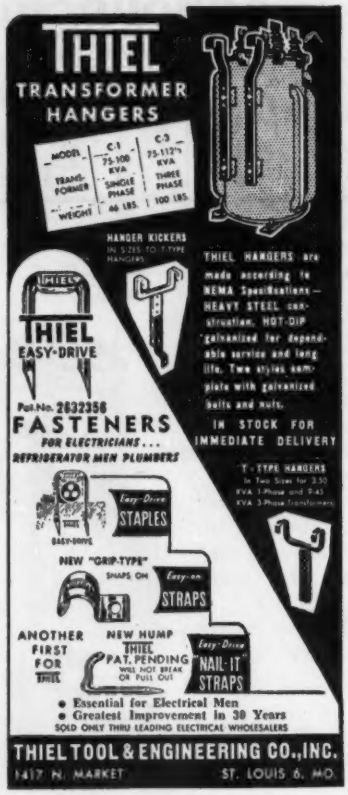
Unistrut Products Co has appointed the following three managers to head newly created divisions: **George McKay,** Electrical and Mechanical Construction Division; **C. T. Walas,** Materials Handling Division; and **F. W. Ingraham,** Partitions and Display Division. In addition, **A. E. Serewicz** is new sales supervisor of the firm's activities in Canada.

Newly elected officers of Buell Engineering Co, Inc, are **Robert F. Playter,** board chairman; **J. A. McBride,** president and general manager; **John H. Nicholls,** vice president and secretary; **Henry Dohrman,** vice president in charge of engineering; **S. J. Pascual,** vice president of sales; **G. P. Gouck,** treasurer; and **Hugh Mullen,** director of purchasing and administrative assistant.

Joseph P. Flynn was recently named manager of the Public Utilities Division for AMP, Inc . . . Permutit Co's new technical manager is **Durando Miller.**

David Dibner has been appointed military products engineering manager of Burndy Corp's Omaton Division. He is former assistant manager of the Milford (Conn.) plant.

THIEL
TRANSFORMER HANGERS



THIEL HANGERS are made according to NEMA Specifications—HEAVY STEEL construction, HOT-DIP galvanized for dependable service and long life. Two styles, complete with galvanized bolts and nuts.

IN STOCK FOR IMMEDIATE DELIVERY

THIEL EASY-DRIVE
Pat. No. 2832356
FASTENERS
FOR ELECTRICIANS . . . REFRIGERATOR MEN PLUMBERS

Easy-Drive STAPLES
NEW "GRIP-TYPE" SNAPS ON Easy-on STRAPS
ANOTHER FIRST FOR THIEL
NEW HUMP THIEL PAT. PENDING WILL NOT BREAK OR PULL OUT
Easy-Drive NAIL-IT STRAPS

- Essential for Electrical Men
- Greatest Improvement in 30 Years

SOLD ONLY THRU LEADING ELECTRICAL WHOLESALERS

THIEL TOOL & ENGINEERING CO., INC.
3417 N. MARKET ST. LOUIS 6, MO.

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If you change your address, remember to wire us in. We can't get your copies of Electrical World to you promptly if we don't know where you are. It will prevent other important mail from going astray if you give your local postmaster the word, too. He'll thank you, we'll thank you, and you'll thank yourself.

Send your old and new address to:
Subscription Department
ELECTRICAL WORLD
330 W. 42nd St., New York 36, N. Y.

Newly named product manager of Orangeburg Manufacturing Co's underfloor duct system is **Richard F. Fagan** . . . The Industrial Division of Gould-National Batteries has named **R. W. Hopewell** manager of field engineering.

Donald C. Mills has been promoted from senior design engineer at Federal Pacific Electric Co's Pacific Switchgear Division, to manager of development engineering for the Eastern Switchgear Division.

Fluor Corp, Ltd, has promoted **J. L. Tathwell** and **F. G. Crawford** to the new post of manager of projects. They formerly served as chief project engineer and manager of project coordination, respectively.

Cyrus Wood has been elected assistant treasurer of Raytheon Manufacturing Co . . . Raytheon's receiving and cathode ray tube operation has as its new operations controller **Robert W. Holmes.**

OBITUARY

George H. Anderson, 59, chief hydroelectric engineer of New England Power Service Co, died at Wellesley, Mass.

E. W. Baird, Jr, 59, president of T. J. Cope, Inc, for the past thirty years, died of pneumonia recently at his Bermuda home.

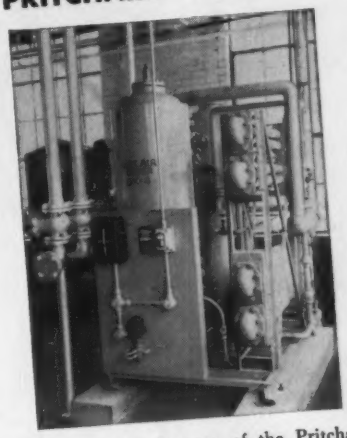
Otis Gerke, 61, treasurer of Wisconsin Power & Light Co since 1930, died recently at a Madison hospital.

Gustave H. Kuechler, 58, manager of licenses and associated companies for Combustion Engineering, Inc, died recently in his New York City office.

C. Floyd Nagle, 74, former president of Scranton Electric Co until its merger with Pennsylvania Power & Light Co last year, died recently. After the merger he served on the PP&L board.

Edwin A. Woodhead, 69, chief consulting engineer and a 50-year service veteran of Idaho Power Co and predecessors, died in Salt Lake City after a short illness.

FOR EFFICIENT LOW-COST DRYING OF INSTRUMENT AND CONTROL AIR . . . CHOOSE A PRITCHARD HYDRYER



Many exclusive features of the Pritchard HYDRYER make it ideal for low-cost drying of instrument air as well as compressed air for air control systems. Features such as:

- NO WASTE—100% of all air entering the HYDRYER is dried without loss
- FULL LINE PRESSURE REACTIVATION—Pressuring and depressuring of adsorbers between cycles is eliminated
- NO PURGING—The Type A HYDRYER uses inlet main air stream for reactivation
- LONGER ADSORBENT LIFE
- NO MOVING PARTS
- SIMPLIFIED OPERATION
- REDUCED EQUIPMENT AND LINE SIZES

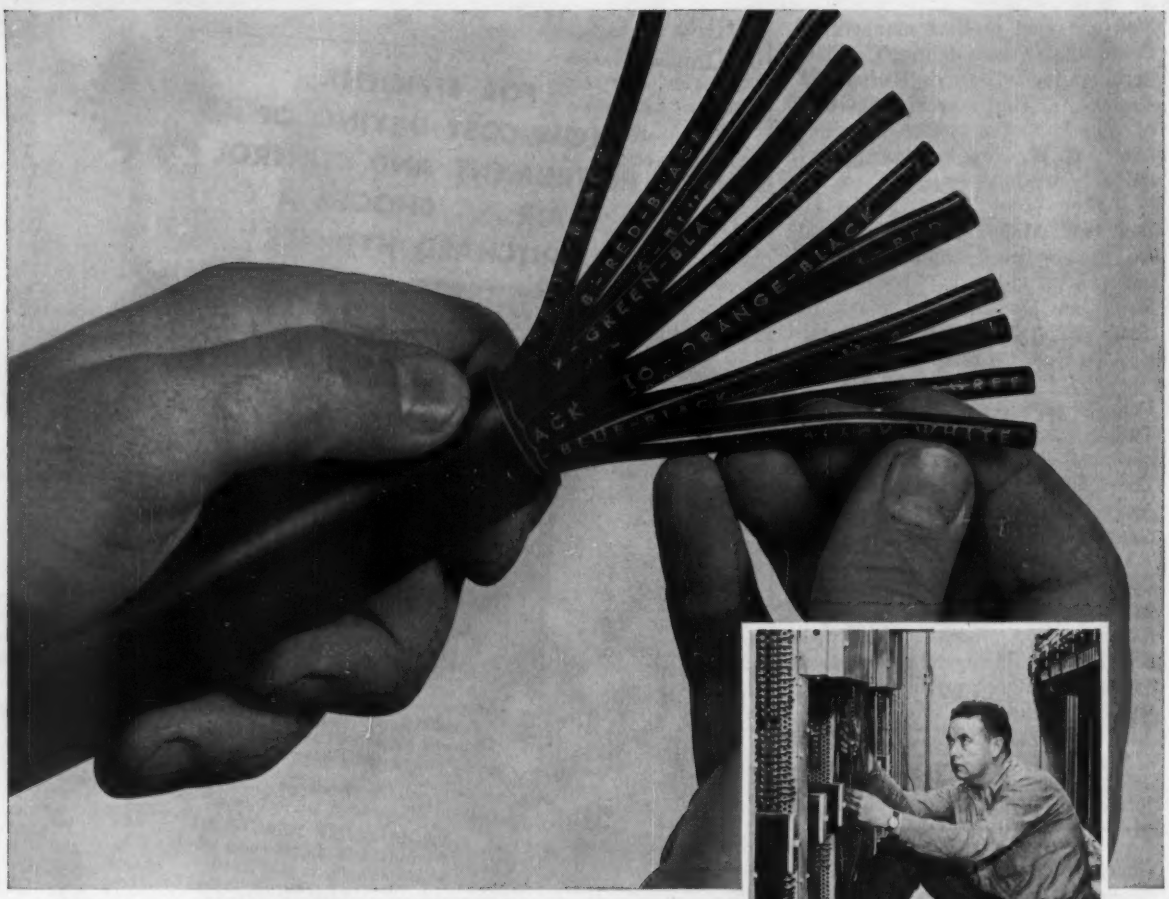
. . . and many other proved advantages.

Joe: This is what we were talking about. Write to Pritchard for a copy of HYDRYER Bulletin 16.0.081

Their address is-

J.F. PRITCHARD & COMPANY of CALIFORNIA
Dept. 574, 4625 Roanoke Parkway
Kansas City 12, Missouri

P.S. Get letter in the mail TODAY
Ben



Color-coded and numbered every 1½"

New Rome station control cable assures quick and positive circuit identification

You can reduce installation expenses and the cost of routine maintenance by specifying Rome control cable (CRO-1) for your next job. Rome's new surface-printed color coding makes it much easier to quickly identify control circuits, even when light is poor or when handling has dirtied conductor coverings. Every conductor is color-coded and numbered *on both sides* at intervals of 1½" or less, and permanently clear white lettering provides maximum legibility.

Three different types of Rome control cable are available:

RoZone insulated—RoPrene sheathed. This is the ultimate in control cable design and performance. Conductors are insulated with RoZone, a high-quality oil-base compound and each conductor is individually sheathed with RoPrene (Neoprene). A RoPrene jacket provides over-all protection. Ask for Type CRO-1.

RoMarine insulated—RoPrene sheathed. This is a more moderately priced, high-quality, general purpose design. Individual conductors are insulated with a heat- and moisture-resistant synthetic rubber compound, and the over-all jacket is RoPrene (Neoprene). Specify Type CRM-1.

Rome RoLene insulated—Rome Synthinol or RoLene sheathed. This cable features a quality thermoplastic construction with Synthinol insulation (polyvinyl chloride) protected by a Synthinol or RoLene jacket. A small diameter moderate cost control cable, this is our Type CT-2.

Specify Rome station control cables for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 800, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

READERS FORUM

"New" Electrical World Wins Approval

To the Editor:

I have just finished reading the "New" Electrical World. The publisher and his staff are to be congratulated on the many improvements that have been made.

I have, as you know, been a constant reader of Electrical World since entering the electric utility engineering field in the early "twenties." The industry has made fantastic progress in that 34 years. Electrical World has consistently progressed with the needs of the industry, but this new face lifting is its most outstanding achievement. I hope other readers agree.

May I add that not the least of these improvements is the elimination of the stiff pages injected throughout the advertising sections, intended to draw the readers interest to the ads on those pages but which actually resulted in discouraging reading by many subscribers of all of the advertising sections.

Again, congratulations on the "New Look," and best wishes for another successful 34 years.

Walter B. Morton
Electrical Engineer
Pennsylvania Power & Light Co
Ninth & Hamilton Streets
Allentown, Pa.

To the Editor:

Congratulations to you and your staff on your Jan. 7 issue of ELECTRICAL WORLD.

Those innovations, format, etc., come along like a breath of fresh air. More power to you.

Ashton B. Collins
President
Reddy Kilowatt, Inc.
50 Church Street
New York 7, N. Y.

To the Editor:

The first copy of the new Electrical World was received this week, and I want to congratulate you and other members of your staff on a fine piece of work. I like the new features and the new type and am happy to learn that we will be getting this regularly.

Electrical World has always been outstanding in the field, as far as I am concerned, and I am sure the improvements made will keep it in top position.

A. W. Herrmann
Moody's Investors Service
99 Church Street
New York 7, N. Y.

To the Editor:

I like the new Electrical World —the Electrical Industry's Weekly Magazine. And I read your editorial in the Jan. 7 issue.

Somewhere in the issue is the admonition to study the book—not just read it. It's a good admonition, but one we can't always follow. For that reason I think all of your readers value the ivory-paged sections and most particularly the 2-minute summary.

I send you my very best wishes for a highly successful 1957.

R. L. Oetting
General Electric Co
Cleveland 12, Ohio

To the Editor:

Just wanted to say congratulations and good work on the new Electrical World. It surely is easier to read, better looking, and I'll bet will pay out in greater style than ever before.

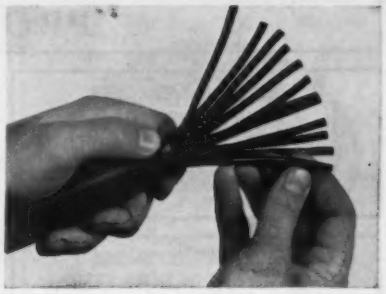
E. R. Dunning
Vice President
N. W. Ayer & Son, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

To the Editor:

I just want to congratulate you and your staff on the "new look" for Electrical World. It's wide awake in every respect. And, I especially like your new breakdown of subject matter.

I wish you every success in your new program.

W. J. Ridout, Jr
Editorial Director
Electricity on the Farm Magazine
305 E. 45th St.
New York 17, N. Y.



New Rome Station Control Cables

Can be ordered from any one of the following sales offices:

ROME CABLE SALES OFFICES

*ATLANTA 13, GA.
156 Simpson St., N.W.
MUrray 8-9860
BOSTON 10, MASS.
Chamber of Commerce Bldg.
80 Federal St.
HAncock 6-7272
*CHICAGO 39, ILL.
4505 West Grand Ave.
SPaulding 2-2700
CLEVELAND 14, OHIO
Society for Savings Bldg.
145 Public Square
SUperior 1-1240
*DALLAS 26, TEXAS
3015 Taylor St.
RIverside 7-4801
*DENVER 4, COLO.
1160 Elati St.
KEystone 4-0533
DETROIT 2, MICH.
547 New Center Bldg.
TRinity 2-7578
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240 Shea Place
FAirfax 3-8385
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*LOS ANGELES 22, CALIF.
2510 South Malt Ave.
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NEW YORK 17, N. Y.
60 East 42nd St.
MUrray Hill 2-6590
PHILADELPHIA 7, PA.
12 South Twelfth St.
MArket 7-2070
PITTSBURGH 22, PA.
1001 Oliver Bldg.
ATlantic 1-0816
ST. LOUIS 17, MO.
6617 Clayton Rd.
VOlunteer 3-4944
*ST. PAUL 4, MINN.
345 N. Wheeler Ave.
Midway 6-7201
*SALT LAKE CITY 1, UTAH
230 South Fourth West St.
ELgin 9-8811
*SAN FRANCISCO 24, CALIF.
1100 Selby St.
VAlencia 6-3580
*SEATTLE 4, WASH.
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RIverside 2-1704

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CORPORATION

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the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

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Permanent opening in Boston office requiring good technical education and diversified design experience. Submit resume with availability and salary requirement or send for our application form.

FAY, SPOFFORD & THORNDIKE, INC.
Consulting Engineers
11 Beacon Street Boston 8, Mass.

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received by 10:00 A.M. Feb. 15 will appear in the Feb. 25 issue, subject to space limitations.

Classified Advertising Division
ELECTRICAL WORLD
P. O. Box 12, New York 36, N. Y.

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ELECTRIC EQUIPMENT CO.
Phone Station Collect GL 3-6783
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New and Used Equipment Available for
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Send for new list to
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Like all proud parents, we like our magazine, and we're pretty sure you like it too. We wouldn't want your copy to be the one that gets lost. So why not give our mailing department a hand when you change your address. All you have to do is fill out the simple forms below . . . or just give us your old and new addresses in any form you want . . . and mail them to Subscription Department, Electrical World, 330 W. 42nd St., New York 36, N. Y.

P.S. You'll be doing yourself a big favor if you notify your local postmaster, too, so he can keep the rest of your important mail coming through.

NEW

Name .....

Address .....

City ..... Zone .. State .....

Company ..... Title .....

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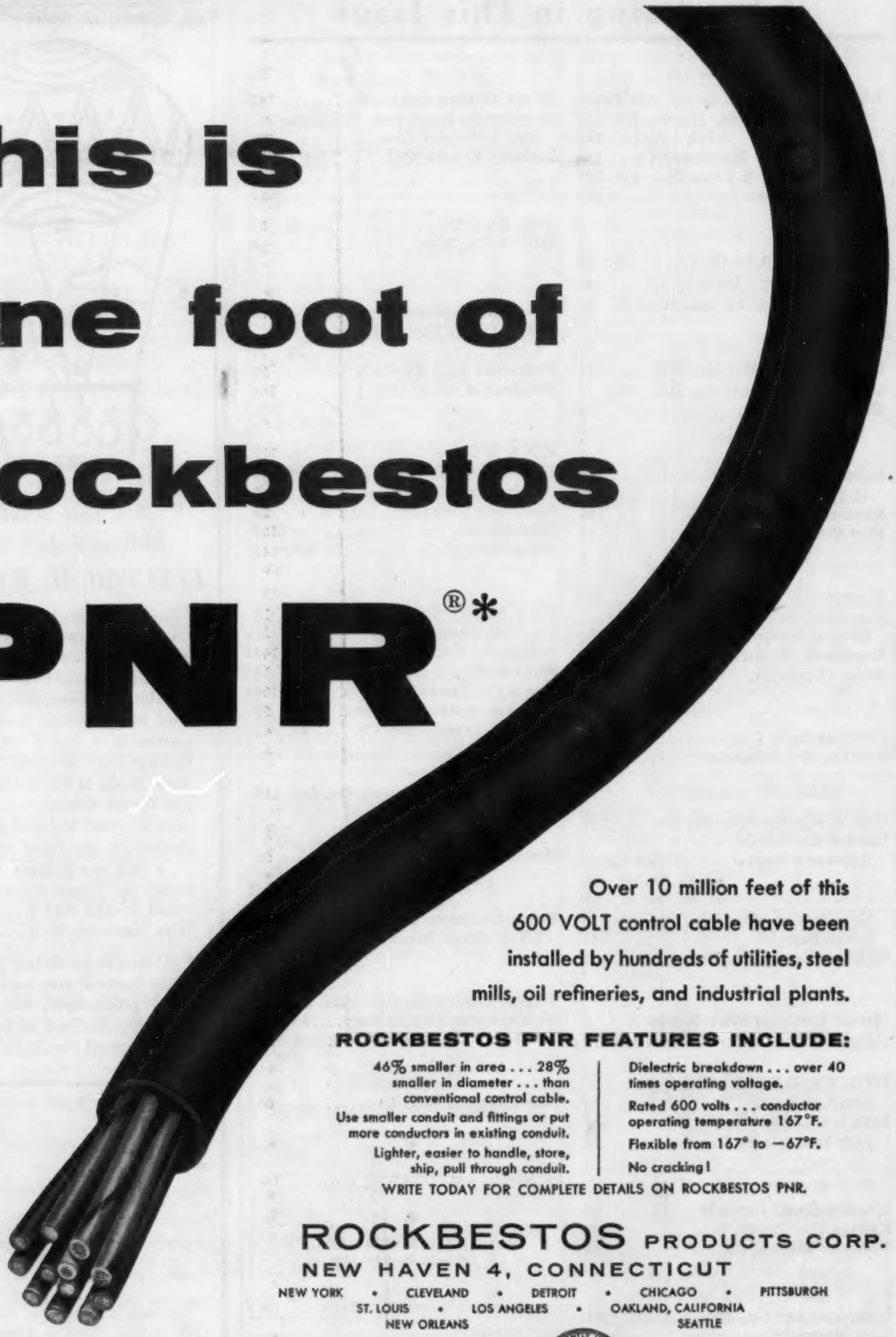
Name .....

Address .....

City ..... Zone .. State .....

ELECTRICAL WORLD
330 W. 42nd St., New York 36, N. Y.

This is One foot of Rockbestos PNR®*



Over 10 million feet of this 600 VOLT control cable have been installed by hundreds of utilities, steel mills, oil refineries, and industrial plants.

ROCKBESTOS PNR FEATURES INCLUDE:

- 46% smaller in area . . . 28% smaller in diameter . . . than conventional control cable.
- Use smaller conduit and fittings or put more conductors in existing conduit.
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- Dielectric breakdown . . . over 40 times operating voltage.
- Rated 600 volts . . . conductor operating temperature 167°F.
- Flexible from 167° to −67°F.
- No cracking!

WRITE TODAY FOR COMPLETE DETAILS ON ROCKBESTOS PNR.

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NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH
ST. LOUIS • LOS ANGELES • OAKLAND, CALIFORNIA
NEW ORLEANS SEATTLE

*P — polyethylene, N — nylon, R — Rockhide (PVC)

WHEN SPACE IS PARAMOUNT

New Switch Design For Moloney Network Transformers Saves Installation Space

You gain 5 inches of valuable vault space because Moloney's new high voltage switch is now 5 inches narrower than formerly. This results in an overall reduction in the length of network transformers, and permits more work space in old vaults . . . or reduces excavation costs on new vaults.

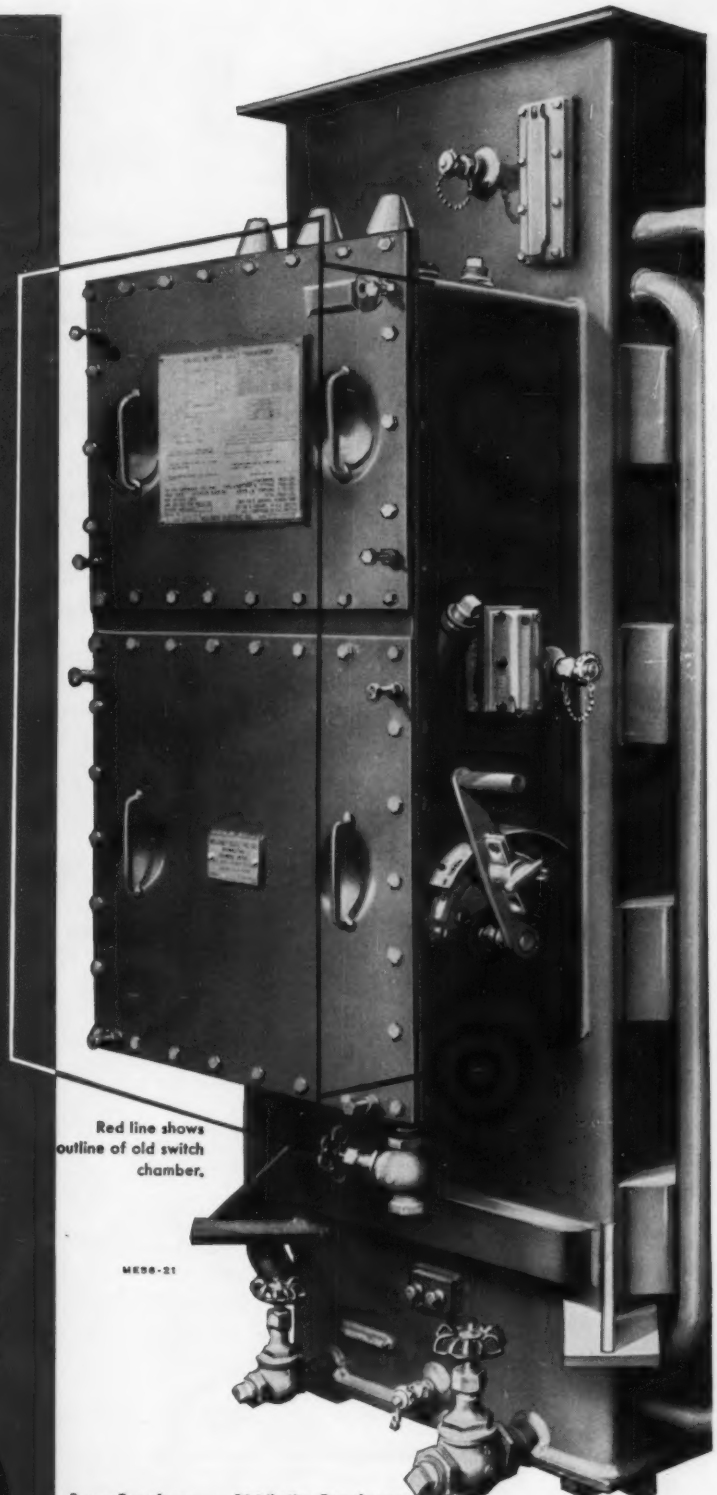
Moloney's new switch has the same liberal current carrying capacity as formerly. Electrical clearances have not been altered. In every way, Moloney's new switch meets NEMA standards fully . . . PLUS Moloney's own high standards of performance dependability.

Save time. Save money. SAVE SPACE. Specify Moloney Network Transformers. They're engineered to provide dependable, continuous service for your network system.

MOLONEY ELECTRIC COMPANY

All Moloney Network Transformers feature positive, foot-proof, high voltage switches that conform to NEMA standards.

MOLONEY ELECTRIC



Red line shows outline of old switch chamber.

ME56-21

Power Transformers • Distribution Transformers
Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators
Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Transformers and Inductors for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CAN.

New

ALLIS-CHALMERS Vault-Type Power Unit

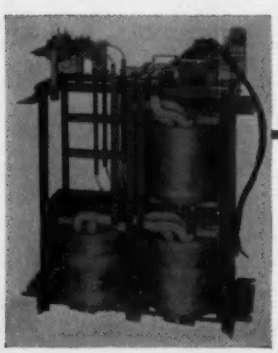
NATIONAL ELECTRICAL Week
FEB. 10-16, 1957

...the modern solution to industrial and commercial load concentration problems

Does the job of three or four distribution transformers

● With sprawling shopping centers and other commercial and industrial construction mushrooming everywhere, the problem of energy distribution is becoming more and more acute. The low-cost, labor-saving, space-saving solution lies in the utilization of Allis-Chalmers vault-type power units.

In a vault or on ground level slab, this Allis-Chalmers unit requires only *half the space* of a bank of distribution transformers. The compactly designed tank contains three or four standard single-phase distribution transformer core and coil assemblies. Three-phase or single *and* three-phase service is provided. Metering transformers can also be included in the tank.



Labor costs are trimmed appreciably. Units are internally connected at the factory, thus power connections at the site are greatly simplified. Complicated primary and secondary bus work is eliminated.

Save on Vault Costs
Reduce Space Requirements

Present vault capacities can be doubled with no additional construction expense. With a slab installation, this unit takes up only half the space of the three or four distribution transformers required to do the job.

On units rated 300 kva and below, space is provided for the addition of a single-phase core and coil assembly to provide both three-phase and single-phase service if desired.

Get the complete story from your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletin 61B8208.

ALLIS-CHALMERS

A-5236